



Project Status Report

High End Computing Capability Strategic Capabilities Assets Program

February 10, 2015

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Pleiades Supercomputer Augmented with Additional Intel Haswell Processors



- The HECC Supercomputing Systems team augmented Pleiades with 14 new Haswell compute racks, expanding the system's overall capability and increasing its total peak performance by 18% – from 4.5 to 5.35 petaflops.
- HECC engineers integrated the racks into the Pleiades InfiniBand (IB) fabric using a live-integration method that developed in-house, to minimize the impact on production cycles.
- 16 Westmere racks were removed from Pleiades to provide the power necessary for the new equipment.
- The integration process, from hardware delivery to production, took 19 business days to complete.

Mission Impact: To meet NASA's requirements for high-performance computing, HECC must regularly and significantly upgrade and replace the supercomputing resources provided to the agency.



The addition of 14 Haswell racks (1,008 nodes) to the Pleiades supercomputer provides 3.23 times the working capacity of 16 Westmere racks that were replaced—without increasing the power required to operate the system.

POCs: Bob Ciotti, bob.ciotti@nasa.gov, (650) 604-4408, NASA Advanced Supercomputing (NAS) Division; Davin Chan, davin.chan@nasa.gov, (650) 604-3613, NAS Division, Computer Sciences Corp.

Visualization Experts Deploy Mini-hyperwall for New Multipurpose Conference Room



- The HECC Visualization and Facilities teams installed the mini-hyperwall in a conference room at the NASA Advanced Supercomputing (NAS) facility. With the addition of a new projector and screen, the room can be used in several display modes:
 - The 9-panel mini-hyperwall can be used to show scientific visualizations (as pictured on the right).
 - It can be used as a video wall driven by a single source, such as a laptop, for showing a PowerPoint presentation.
 - The projector and screen, coupled with a Polycom phone system, make the room suitable for WebEx-based meetings.
- The Visualization team also worked with NAS Division management to tailor existing demonstration scripts from the full-sized hyperwall for use on the mini-hyperwall.
- Creation of this multi-purpose conference room is expected to result in an increased requests for outreach events, such as demonstrations and facility tours.

Mission Impact: The mini-hyperwall permits more public outreach events, such as facility tours, without impacting ongoing science and engineering work on the full-sized hyperwall.



NAS visualization expert David Ellsworth at the console of the mini-hyperwall, which is displaying three views of three different cases of a simulation of the Space Launch System Scale Model Acoustic Test. The computational fluid dynamics simulation was performed by HECC user Tanner Nielsen at Marshall Space Flight Center.

POCs: David Ellsworth, david.ellsworth@nasa.gov, (650) 604-0721, NASA Advanced Supercomputing (NAS) Division, Computer Sciences Corp.; Chris Tanner, christopher.tanner@nasa.gov, (650) 604-6754, NAS Division, Computer Sciences Corp.

Network Engineers Complete Transition of NASLAN to IPv6



- HECC network engineers are among the first teams in the agency to transition a NASA network to Internet Protocol version 6 (IPv6).
- The transition was a collaborative effort involving the HECC Systems, Networks, and Security teams.
- Currently, 95% of the systems have been transitioned. The remaining 5% of the systems are supported under Advanced Control and Evolvable Systems (ACES) and will be transitioned by that group at a later date.
- All external communication over the network now supports both IPv4 and IPv6 protocols.
- The Networks team also provided four IPv6 training sessions to HECC support staff during the transition.
- In addition, as part of the transition, the team ported a number of tools to support the new IPv6 environment.

Mission Impact: By carefully planning and executing the transition to IPv6, HECC network engineers were able to complete this government-mandated upgrade with no impact to the HECC user community.

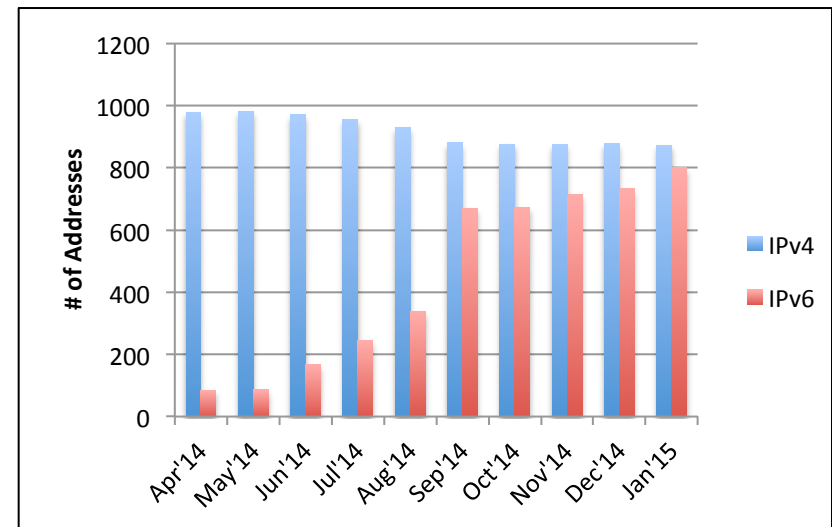


Chart showing the transition to IPv6 from project start to completion.

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Advanced Supercomputing Division, Computer Sciences Corp.

Systems Engineers Resolve Tape Library Performance Issue



- The HECC Supercomputing Systems team identified, analyzed, and resolved an issue with slow tape write performance that was adversely impacting the archive environment.
- After noticing a significant backlog of data waiting to be written to tape from the disk cache on the Lou archive system, the team determined that the problem was the manner in which data was being written to the disk cache by the mcp (Maximum CoPy) transfer tool, developed in-house for HECC users.
- Once the cause was identified, they quickly developed a fix to the mcp tool, eliminated the backlog, and returned the archive system to optimal performance.

Mission Impact: By identifying and correcting issues quickly, HECC systems and storage experts can optimize the productivity of NASA resources.



The mcp transfer tool, developed at the NASA Advanced Supercomputing (NAS) facility for HECC users, utilizes multiple types of parallelism to achieve maximum copy and checksum performance on clustered file systems like the Lou archive system, pictured above.

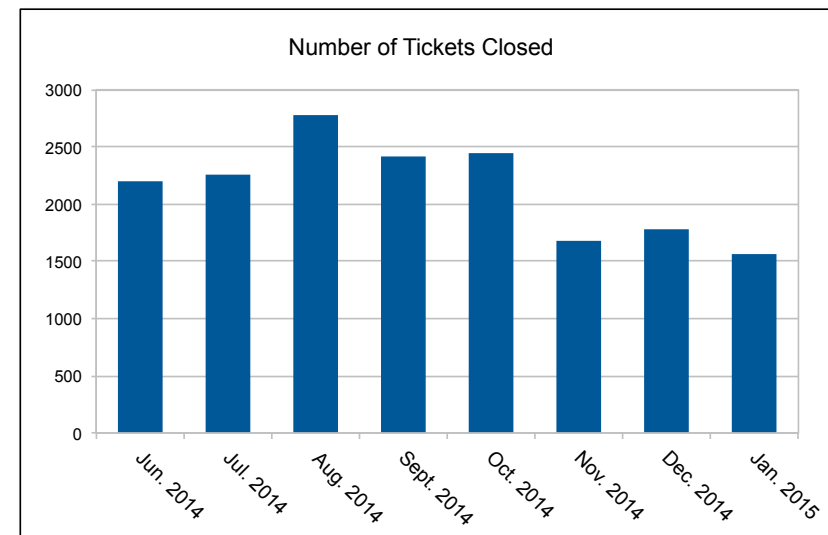
POCs: Bob Ciotti, bob.ciotti@nasa.gov, (650) 604-4408, NASA Advanced Supercomputing (NAS) Division; Davin Chan, davin.chan@nasa.gov, (650) 604-3613, NAS Division, Computer Sciences Corp.

HECC Support Staff Provide Excellent Ongoing Support to Users



- HECC staff processed, tracked, and resolved more than 17,000 tickets over the past eight months, and provided 24x7 support for hundreds of users from all of NASA's mission directorates.
- Tickets covered the spectrum of HECC activities, and ranged from automated notifications of hardware problems to users calling for help on compiler problems or requesting explanations of job failures.
- Support services for this 8-month snapshot included:
 - Handling inquiries about accounts, allocations, jobs, and system status.
 - User application modification and optimization.
 - Improving data transfer times and solving data storage/retrieval issues.
 - Development of high-resolution visualizations of scientific and engineering results.
 - Custom, one-on-one support for the entire range of support services.

Mission Impact: HECC experts provide high-quality, 24x7 support that resolves system problems and users' technical issues, and enables users to focus on their critical mission projects.



HECC staff resolved about 2,000 Remedy tickets per month over the last 8 months—more than 17,000 tickets total.

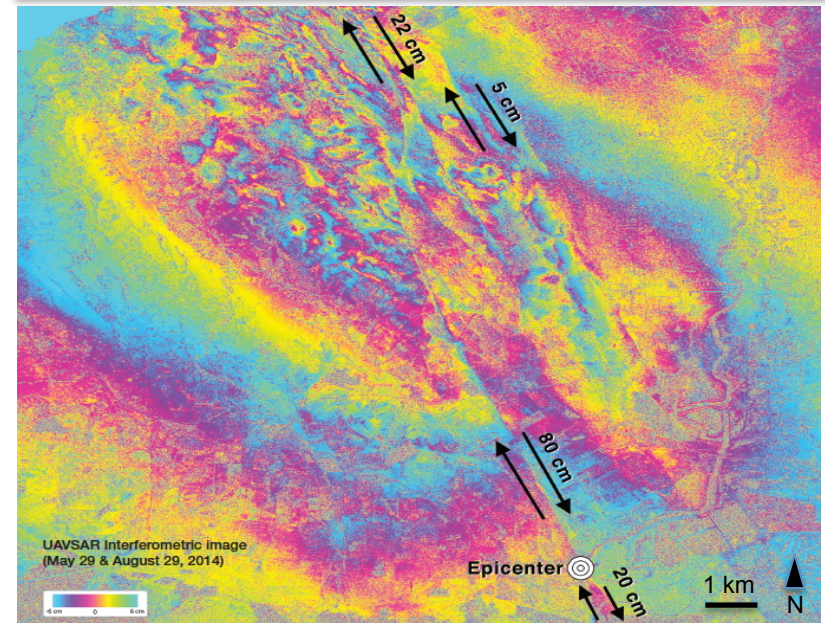
POC: Leigh Ann Tanner, leighann.tanner@nasa.gov, (650) 604-4468, NASA Advanced Supercomputing Division, Computer Sciences Corp.

Airborne Repeat-Pass Interferometer to Study Surface Deformation and Forest Structure*



- Scientists are using repeat-pass interferometric (InSAR) data from Uninhabited Airborne Vehicle Synthetic Aperture Radar (UAVSAR) to study centimeter-scale surface deformation of earthquake faults, volcanoes, landslides, and glaciers.
- The computationally intensive InSAR processing code was ported to Pleiades in Spring 2013 to take advantage of the large number of processing nodes, each with more than 32 GB RAM, and ample data storage.
- With Pleiades and processor automation, HECC was able to clear a 5-year InSAR processing backlog in 6 months and reduce processing latency to 2 weeks.
- Moving the large volume of input and output data during InSAR processing is handled effortlessly in Pleiades, and temporary data storage of 50 TB (typical) to 180 TB at the peak of processing posed no issue either. Average CPU usage was over 500 SBU/day while the project was working off the backlog. Median usage is 120 SBU/day.
- The project is planning to host a copy of the UAVSAR raw data archive at Ames' tape backup (lou) to reduce the need to ftp raw data to Ames repeatedly while InSAR processing is repeated to optimize processing parameters for time series analysis.

Mission Impact: Enabled by NASA's Pleiades supercomputer, UAVSAR was able to clear a 5-year processing backlog to deliver surface deformation products to scientists for research.



UAVSAR Interferometric image (May 29 & August 29, 2014) of the M6.0 South Napa Earthquake, California. The colors in the image represent the amount of ground motion between the two flights from the radar's point of view. Linear discontinuities in the colors indicate locations where a surface rupture is highly likely, giving government agencies the exact location of the fault traces that shifted during the earthquake and how they relate to levees, buildings, and vital infrastructures, as well as to help provide a fundamental understanding of earthquakes processes. *Andrea Donnellan, NASA/JPL*

* HECC provided supercomputing resources and services in support of this work

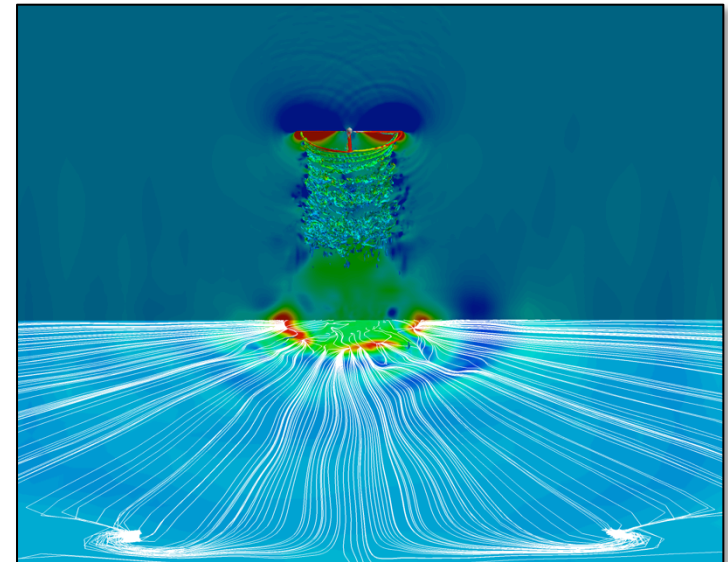
POC: Yunling Lou, yunling.lou@jpl.nasa.gov, (818)354-2647; Scott Hensley, scott.hensley@jpl.nasa.gov, (818)354-3322, NASA/JPL

Validating Rotorcraft Simulations with Improved Wind Tunnel Measurements *



- To validate and improve the accuracy of rotor models, researchers at NASA Ames are performing high-fidelity computational fluid dynamics (CFD) simulations of experimental rotor tests on Pleiades, in support of NASA's Rotary Wing (RW) project, now called Revolutionary Vertical Lift Technology (RVLT).
 - One RW project goal is to develop accurate multidisciplinary design analysis and optimization (MDAO) tools for new civil rotorcraft concepts using high-fidelity CFD codes. Higher levels of measurement accuracy are needed to validate the improved accuracy of CFD rotorcraft simulation methods.
 - To support a planned RW hover experiment to validate modern CFD codes, the Ames team carried out several pre-test hover computations to examine how different test facilities affect rotor performance and vortex wake geometries. These computations will be used to help design a better experiment.
 - The team also performed OVERFLOW CFD simulations of a rotor and fuselage in the National Full-Scale Aerodynamics Complex (NFAC) to assess how the wind tunnel's test section and test stand affect the measured rotor performance, vortex wake properties, and vortex interaction with the fuselage.
- Researchers will continue to validate their OVERFLOW CFD code with existing and future high-resolution wind tunnel measurements. The code will also be placed in an MDAO framework to examine and optimize future rotorcraft concepts.

Mission Impact: Complex, high-fidelity simulations, made possible by the Pleiades supercomputer, are helping engineers to better understand the complex airflow interactions caused by spinning rotors, in order to develop more efficient rotorcraft designs.



Snapshot from an OVERFLOW simulation of a helicopter rotor, hovering at 20 feet, with streamlines along the floor of the National Full-Scale Aerodynamics Complex. The vertical cutting plane shows acoustic pressure waves. Vortices are colored by vorticity; floor and vertical plane by pressure, (red=high, blue=low). *Neal Chaderjian, NASA/Ames*

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* HECC provided supercomputing resources and services in support of this work

HECC Continues to Support NASA's Search for Exoplanets in Kepler Data, New TESS Mission *



- Kepler, NASA's first mission capable of finding Earth-sized and smaller planets, continuously observed more than 200,000 stars during its primary four-year mission. Kepler researchers are currently using the Pleiades supercomputer to:
 - Determine the frequency of terrestrial and larger planets in or near the habitable zones of their stars, and find the distribution of planet sizes.
 - Create a catalog of planet candidates found in the Kepler data.
 - Estimate the planet candidate detection rate and false alarm rate for the Kepler science pipeline.
- A follow-up to Kepler, the Transiting Exoplanet Survey Satellite (TESS) mission, is scheduled to launch in 2017. TESS will utilize HECC supercomputing capabilities for nearly all of its computational needs.
 - TESS will survey more than 500,000 stars during its planned two-year mission.
 - HECC resources will enable the TESS science pipeline to handle data at 10x the rate of the Kepler mission.
 - Every 27 days, TESS will observe a 96-degree swath of sky and project researchers will produce a new dataset for use by the scientific community.

* HECC provides supercomputing resources and services in support of this work

Mission Impact: HECC resources and teams have contributed to the success of the Kepler mission by significantly speeding analysis of the Kepler data pipeline. By providing support for the upcoming TESS mission, HECC will continue to play a key role in NASA's search for exoplanets.

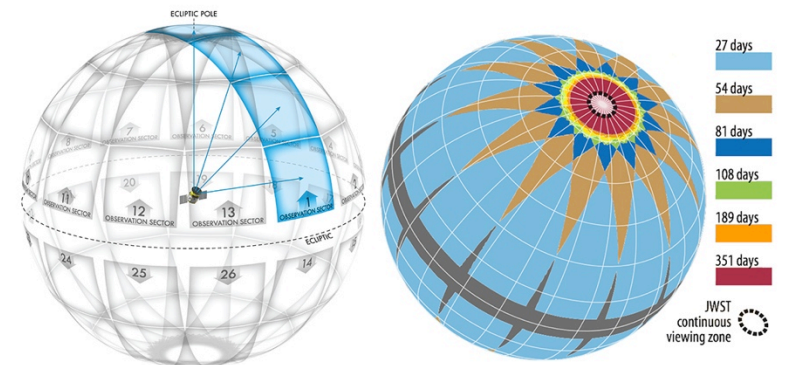


Chart showing the planned viewing regions of stars where the Transiting Exoplanet Survey Satellite (TESS) mission will search for the periodic dimming of stars that indicates an exoplanet. TESS researchers plan to use HECC supercomputing resources for nearly all of their computational needs.

POCs: Sean McCauliff, sean.d.mccauliff@nasa.gov, (650) 604-2419, Wyle Labs, Dwight Sanderfer, dwight.t.sanderfer@nasa.gov, (650) 604-3452, NASA Ames Research Center

HECC Facility Hosts Several Visitors and Tours in January 2015



- HECC hosted 5 tour groups in January; guests learned about the agency-wide missions being supported by HECC assets, and some of the groups also viewed the D-Wave Two quantum computer system. Visitors this month included:
 - U.S. Representative John Culberson (R-Texas) visited NASA Ames to learn more about our research, including Kepler, astrophysics and planetary science, and rocket work for the Space Launch System. Culberson chairs the Commerce, Justice, and Science subcommittee that funds NASA; Pete Worden hosted the visit and presented an Ames overview at the NAS facility.
 - A group from the British government visited Ames for potential collaborations in high-end computing. Guests included Sir Mark Walport, UK Government Chief Scientific Adviser and Head of the Government Office for Science; Giles Robertson, Private Secretary to Walport; and Priya Guha, British Consul General, Rhona McDonald, West Coast Regional Director, Science and Innovation, and Victoria Lee, Head of Science and Innovation, all from the British Consulate, San Francisco.
 - A group from the VTT Technical Research Center of Finland and the Otaniemi technology hub visited NASA Ames to further explore potential common interests in Big Data. Guests included Alfonso Gutierrez, Otaniemi Director for R&D, Innovation & Startups; Jaakko Hollmen, Chief Research Scientist, Department of Information and Computer Science, Aalto University; and Alon Peled, Associate Professor, Hebrew University of Jerusalem.
 - Amanda Brady Ford, Max Planck Institute for Astrophysics, Germany, gave the Ames Director's Colloquium this month and asked to visit the HECC facility. NAS Visualization Team lead Chris Henze presented an overview and scientific demonstration on the hyperwall.



U.S. Representative John Culberson (third from left), listens as HECC visualization team lead Chris Henze, points out features in a launch environment simulation, displayed on the hyperwall.

POC: Gina Morello, gina.f.morello@nasa.gov, (650) 604-4462, NASA Advanced Supercomputing Division

Papers and Presentations



- **225th AAS Meeting**, January 4-8, 2015, Seattle, WA
 - **"Validation of Twelve Small Kepler Transiting Planets in the Habitable Zone"**, by Guillermo Torres et al., including Chris Henze, accepted for publication by the Astrophysical Journal (ApJ96816R1). Featured at a press conference at the AAS meetings.
 - **"Planetary Candidates Observed by Kepler V: Planet Sample from Q1-Q12 (36 Months)"**, by Jason Rowe et al., including Chris Henze, accepted for publication in the Astrophysical Journal (ApJS97596). The material in this paper was presented at the AAS meetings.
 - **"Planetary Candidates Observed by Kepler VI: Planet Sample from Q1-Q16 (47 Months)"**, by Fergal Mullally et al., including Chris Henze, provisionally accepted by the Astrophysical Journal, pending minor revisions. Featured at a press conference at the AAS meetings.
 - **"A Data Exploration Tool for Large Sets of Spectra"**, by Duane Carbon and Chris Henze, a poster presented at the AAS meetings.
 - **"The Kepler False Positive Table"**, by Steve Bryson, et al., including Chris Henze, a poster presented at the AAS meetings.
 - **"A Search for Microlensing Signals in the Kepler Field"**, by Kelsey Hoffman, Jason Rowe, and Chris Henze, a poster presented at the AAS meetings.

** HECC provided supercomputing resources and services in support of this work*

Papers and Presentations (cont.)



- **AIAA SciTech 2015**, January 5-9, 2015, Kissimmee, FL
 - **“Aerodynamic Shape Optimization Benchmarks with Error Control and Automatic Parameterization,”** G. Anderson, M. Nemec, M. Aftosmis. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-1719>
 - **“CFD Simulations of the Space Launch System Ascent Aerodynamics and Booster Separation,”** S. Rogers, D. Dalle, W. Chan. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-0778>
 - **“Adaptive Shape Control for Aerodynamic Design,”** G. Anderson, M. Aftosmis. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-0398>
 - **“Higher-Order Methods for Compressible Turbulent Flows Using Entropy Variables,”** L. Diosady, S. Murman. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-0294>
 - **“Simulations of Atmospheric-Entry Capsules in Subsonic Flow,”** S. Murman, R. Childs, J. Garcia. * *Paper not currently available online*
 - **“Implicit Large-Eddy Simulations of Zero-Pressure Gradient, Turbulent Boundary Layer,”** S. Sekhar, N. Mansour. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-1987>
 - **“Implicit LES of Turbulent, Separated Flow: Wall-Mounted Hump Configuration,”** S. Sekhar, N. Mansour, D. Higuera Caubilla. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-1966>

* HECC provided supercomputing resources and services in support of this work

Papers and Presentations (cont.)



- **AIAA SciTech 2015 (cont.)**
 - **“Computational Analysis of a Flow Around Two-Dimensional Streamlined Bodies with OpenFOAM,”** S. Murman, et al. *
<http://arc.aiaa.org/doi/abs/10.2514/6.2015-0519>
 - **“Optimized Off-Design Performance of Flexible Wings with Continuous Trailing-Edge Flaps,”** D. Rodriguez, M. Aftosmis, M. Nemec, G. Anderson. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-1409>
 - **“Dissociation and Energy Transfer Study of N₂-N and N₂-N₂ Interactions by Using Rovibrational and Coarse-Grained State-to-State Models,”** R. Jaffe, D. Schwenke, et al. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-0480>
 - **“MDO: Wing Design Applications,”** G. Anderson, M. Aftosmis. *
Paper not currently available online
 - **“OpenFOAM Simulations of Atmospheric-Entry Capsules in the Subsonic Regime,”** B. Nikaido, S. Murman, J. Garcia. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-0313>
 - **“Electron-Impact Excitation Cross Sections for Modeling Non-Equilibrium Gas,”** W. Huo, Y. Li, A. Wray, D. Carbon, M. Panesi. * (Paper not currently available online)
 - **“N+3 Configuration Concepts and Enabling Technologies in NASA’s Fixed Wing Project,”** N. Madavan, R. Wahls (chairs). *Paper not currently available online*
 - **“RANS/LES Applications,”** N Georgiadis, J. Ahmad (chairs).

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Papers and Presentations (cont.)



- **AIAA SciTech 2015 (cont.)**

- **“Development of a High Fidelity RDE Simulation Capability,”** P. Cocks, A. Holley, C. Greene, M. Hass. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-1823>
- **“Hybrid Reynolds-Averaged / Large Eddy Simulation of a Cavity Flameholder; Assessment of Modeling Sensitivities,”** R. Baurle. *
<http://arc.aiaa.org/doi/pdfplus/10.2514/6.2015-0637>
- **“Large Eddy Simulation of High-Speed, Premixed Ethylene Combustion,”** K. Ramesh, J. Edwards, H. Chelliah, C. Goynes, J. McDaniel, R. Rockwell, J. Kiris, A. Cutler, P. Danehy. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-0356>
- **“Aerodynamic Modeling and Database Development of the Space Launch System Booster Separation,”** B. Pamadi, J. Pei, C. Gumbert, L. Green, J. Ross, J. Houseman, J. Onufer, C. Kiris. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-0779>
- **“Acoustic Radiation from High-Speed Turbulent Boundary Layers in a Tunnel-like Environment,”** C. Zhang, L. Duan. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-0836>
- **“A priori and a posteriori Analyses of Multi-Species Turbulent Mixing Layers at Supercritical-p Conditions,”** G. Borghesi, J. Bellan. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-0162>
- **“An Investigation of Transonic Resonance in a Mach 2.2 Round Convergent-Divergent Nozzle,”** V. Dippold, K. Zaman. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-0734>

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Papers and Presentations (cont.)



- **AIAA SciTech 2015 (cont.)**
 - **“Detached Eddy Simulation Results for a Space Launch System Configuration at Liftoff Conditions and Comparison with Experiment,”** S. Krist, F. Ghaffari. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-0776>
 - **“Aerodynamic Shape Optimization of a Dual-Stream Supersonic Plug Nozzle,”** C. Heath, J. Gray, M. Park, E. Nielsen, J.-R. Carlson. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-1047>
 - **“Numerical Study of the High-Speed Leg of a Wind Tunnel,”** S. Nayani, W. Sellers, S. Brynildsen, J. Everhart. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-2022>
 - **“Visualization and Quantification of Rotor Tip Vortex in Helicopter Flows,”** D. Kao, J. Ahmad, T. Holst. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-1369>
 - **“Quantitative Determination of Species Production from the Pyrolysis of the Phenolic Impregnated Carbon Ablator,”** N. Mansour, H.-W. Wong, J. Peck, J. Assif, J. Lachaud. *
<http://arc.aiaa.org/doi/pdf/10.2514/6.2015-1447>
- **“Properties of a Mesoscale Convective System in the Context of an Isentropic Analysis,”** A. Mrowiec, O. Pauluis, A. Fridlind, A. Ackerman, Journal of Atmospheric Sciences (Early Online Release), January 2015. *
<http://journals.ametsoc.org/doi/abs/10.1175/JAS-D-14-0139.1>

** HECC provided supercomputing resources and services in support of this work*

Papers and Presentations (cont.)



- **“Numerical Simulation of Hot Accretion Flows (III): Revisiting Wind Properties Using Trajectory Approach,”** F. Yuan, Z. Gan, R. Narayan, A. Sadowski, D. Bu, X.-N. Bai, arXiv: 1501.01197 [astro-ph.HE], January 6, 2015. *
<http://arxiv.org/abs/1501.01197>
- **“Boundary Between Stable and Unstable Regimes of Accretion. Ordered and Chaotic Unstable Regimes,”** A. Blinova, M. Romanova, R. Lovelace, arXiv:1501.01948 [astro-ph.SR], January 8, 2015. *
<http://arxiv.org/abs/1501.01948>
- **Reliability and Maintainability Symposium (RAMS)**, Jan. 26-29, 2015, Palm Harbor, FL
 - **“Comparative Analysis of Static and Dynamic Probabilistic Risk Assessment,”** C. Mattenberger. *
 - **“Susceptibility of Spacecraft to Impact-Induced Electromagnetic Pulses,”** D. Mathias, A. Fletcher, S. Close. *
 - **“Rocket Engine Failure Propagation Using Self-Evolving Scenarios,”** D. Mathias, S. Motiwala. *
 - **“Evaluation of High-Order Overset Numerical Methods for Direct and Large-Eddy Simulations of Turbulent Flows,”** S. Murman, N. Madavan. *

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- **Discovery of Eight New Planets Increases Possibility of Finding Earth's Twin**, *CBS News*, January 6, 2015—Scientists discover eight new planets using data from the Kepler space telescope, marking 1,000 exoplanet candidates discovered by the Kepler Mission, which utilizes the BLENDER program on the Pleiades supercomputer as part of the mission's light-curve analysis pipeline.
<http://www.cbsnews.com/news/discovery-of-eight-new-planets-increases-possibility-of-finding-earths-twin/>
- **ALIEN EARTH: Red Sun's Habitable World Spotted 470 Light Years Away**, *The Register (UK)*, January 7, 2015.
http://www.theregister.co.uk/2015/01/07/alien_earth_with_a_red_sun_discovered_470_lightyears_away
- **NASA Discovers Eight New Planets in "Goldilocks" Zone**, *HPCwire*, January 8, 2015.
<http://www.hpcwire.com/2015/01/08/nasa-discovers-eight-new-planets-goldilocks-zone/>
- **NASA's Pleiades Supercomputer Performance Increases to 5.35 Petaflops—Second Update in Three Months**, *SGI Press Release (Blog)*, January 23, 2015—SGI announces the successful upgrade of the Pleiades supercomputer, which has a new theoretical peak performance of 5.35 petaflops (5.35 quadrillion operations per second).
<http://blog.sgi.com/nasa-pleiades/>



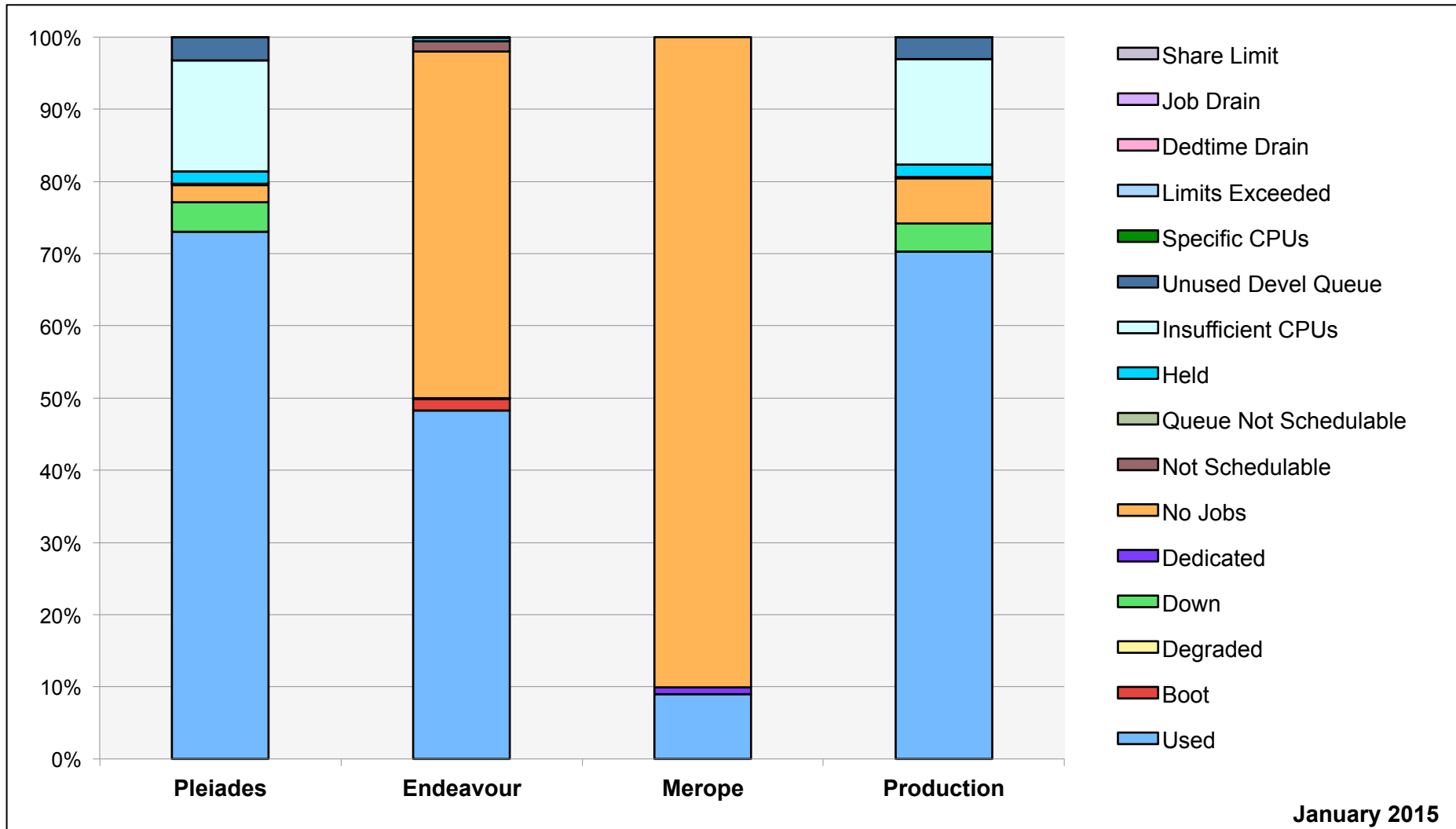
- **NASA Observatories Take an Unprecedented Look into Superstar Eta Carinae**, *Phys.org*, January 7, 2015—Surprising new observations of Eta Carinae presented at the American Astronomical Society's annual winter meeting in Seattle reveal previously unknown features of the binary star system. NASA Goddard's Tom Madura talks about how the team utilized the Pleiades supercomputer to create a 3D model of the star system.
<http://phys.org/news/2015-01-nasa-observatories-unprecedented-superstar-eta.html>
 - **Stunning 3D Models Reveal Bizarre Double Star Acting Up**, *National Geographic*, January 8, 2015.
<http://news.nationalgeographic.com/news/2015/01/150108-eta-carinae-3d-space-astronomy-pictures-science/>
 - **Watch the Brightest Star System Near Earth Explode**, *Motherboard (VICE)*, January 8, 2015.
<http://motherboard.vice.com/read/watch-the-brightest-star-system-near-earth-explode>
- **Tales From the Superbowl of Astronomy, Meeting Brief: Hunting for Exomoons**, *National Geographic, Phenomena*, January 12, 2015—Science journalist Nadia Drake presents some of the highlights from the American Astronomical Society meeting in Seattle, WA. The article includes a brief interview with David Kipping (Harvard-Smithsonian Center for Astrophysics) about his work locating exomoons based on Kepler data, which he will expand on next year using the Pleiades supercomputer.
http://phenomena.nationalgeographic.com/2015/01/12/tales-from-the-superbowl-of-astronomy/#attachment_166635

News and Events (cont.)

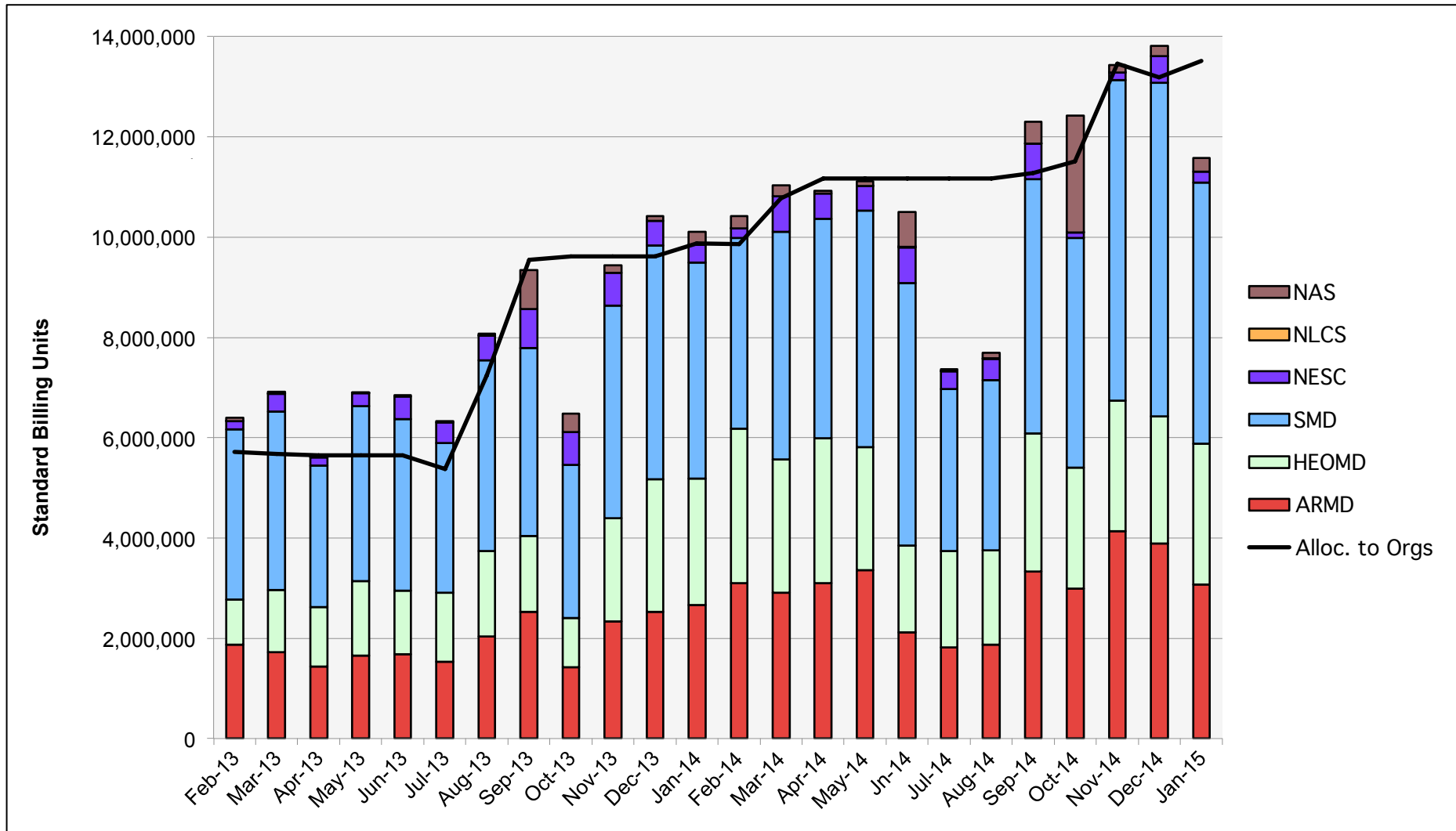


- **NASA Supercomputer Assists the Hunt for Exomoons**, *NASA Ames image feature*, January 30, 2015—A team of 21st-century explorers working for the Hunt for Exomoons with Kepler (HEK) project, based at Harvard University, are searching for exomoons using data from NASA's Kepler mission and the Pleiades supercomputer. Originally published on the NAS Division website on Jan. 29.
<http://www.nasa.gov/ames/nasa-supercomputer-assists-the-hunt-for-exomoons/#.VMwgR0iRL7E>

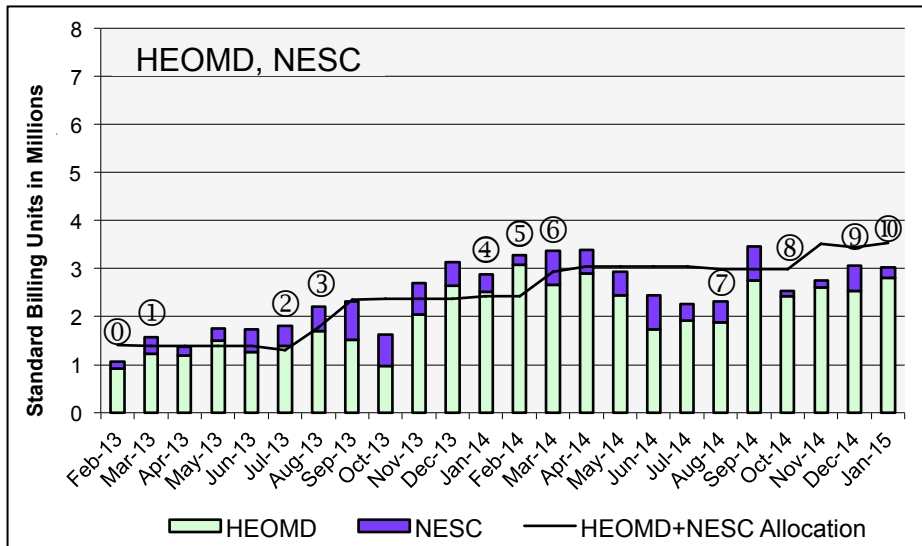
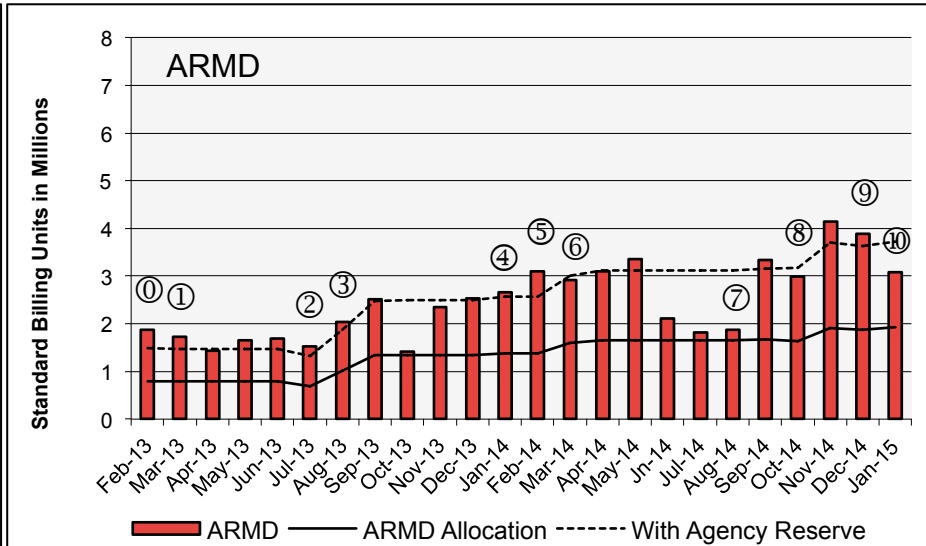
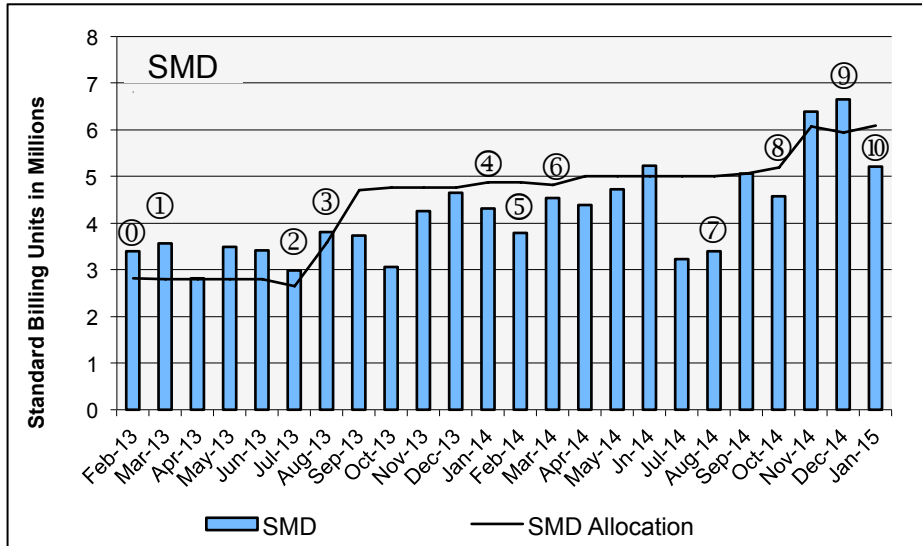
HECC Utilization



HECC Utilization Normalized to 30-Day Month

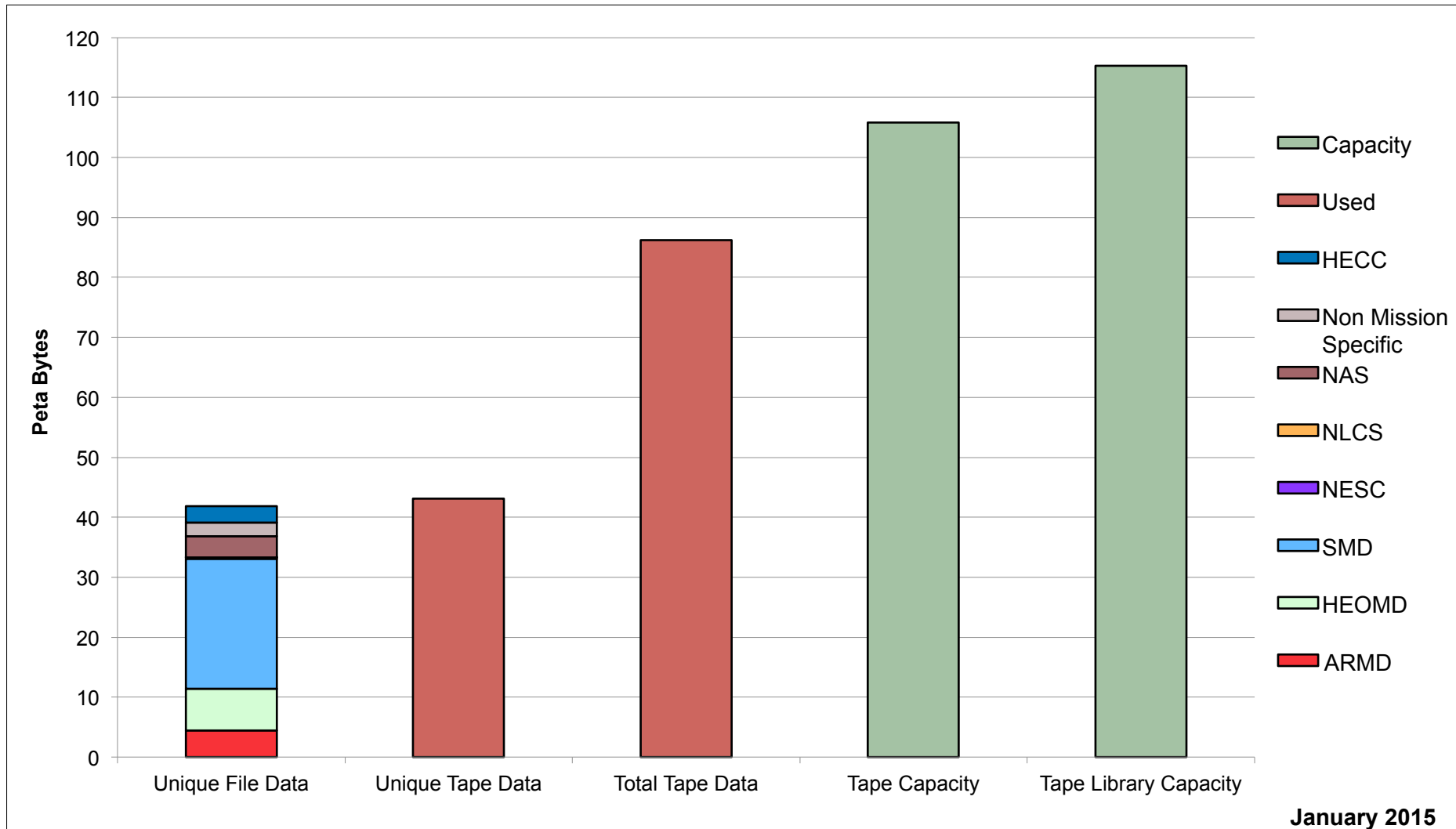


HECC Utilization Normalized to 30-Day Month



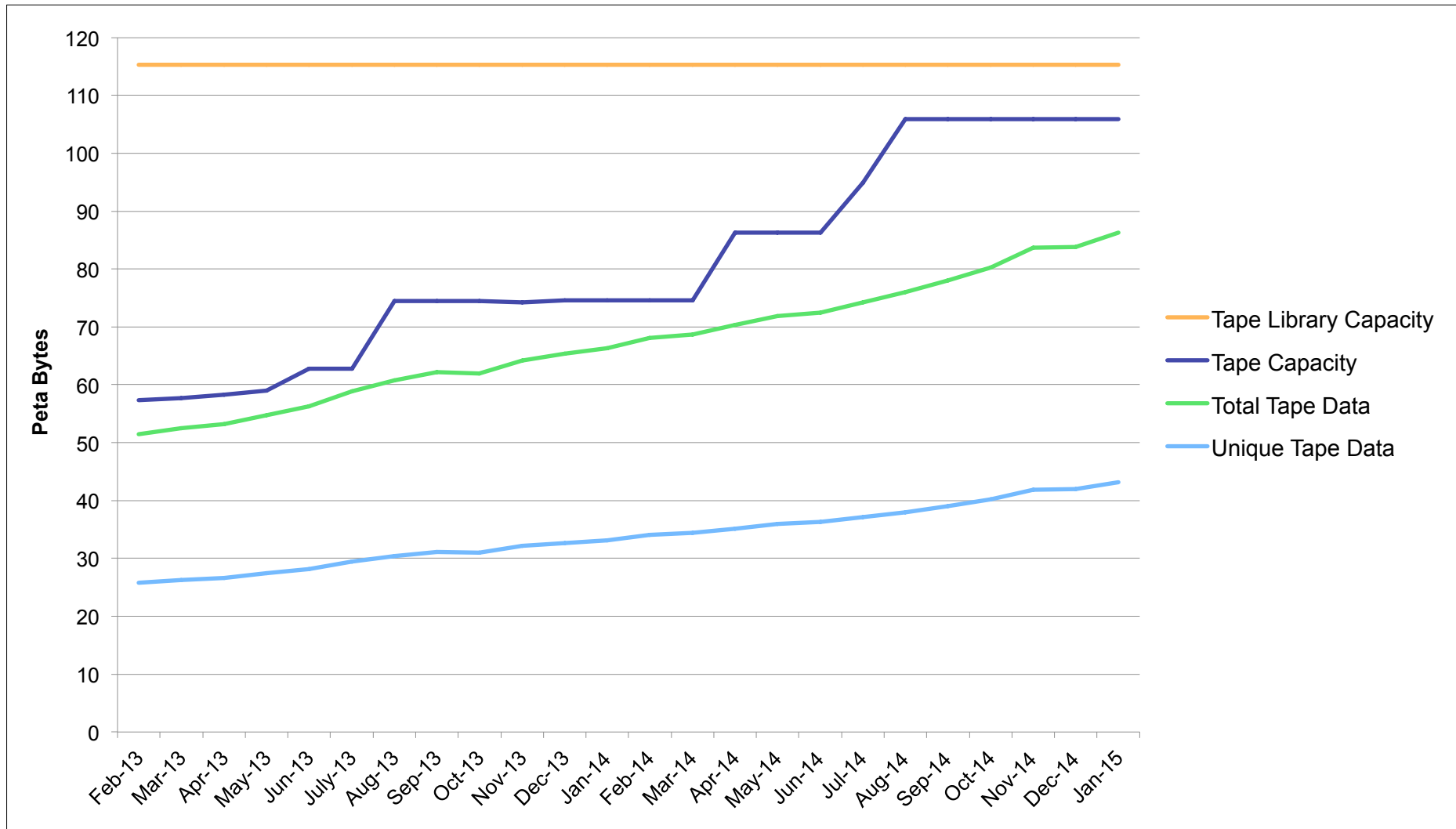
- ① Columbia 21, 23, and 24 retired, Endeavour 2 added
- ② Columbia 22 retired; Endeavour 1 added
- ③ 32 Harpertown Racks retired
- ④ 32 Harpertown Racks retired; 46 Ivy Bridge Racks added
- ⑤ 6 Ivy Bridge Racks added; 20 Nehalem, 12 Westmere Racks Retired
- ⑥ 8 Ivy Bridge Racks added mid-Feb; 8 Ivy Bridge Racks added late Feb.
- ⑦ 4 Ivy Bridge Racks added mid-March
- ⑧ 6 Westmere Racks added to Merope, Merope Harpertown retired
- ⑨ 16 Westmere Racks retired; 10 Nehalem Racks and 2 Westmere Racks added to Merope; 3 Ivy Bridge Racks added; 15 Haswell Racks added
- ⑩ 14 Haswell Racks added

Tape Archive Status

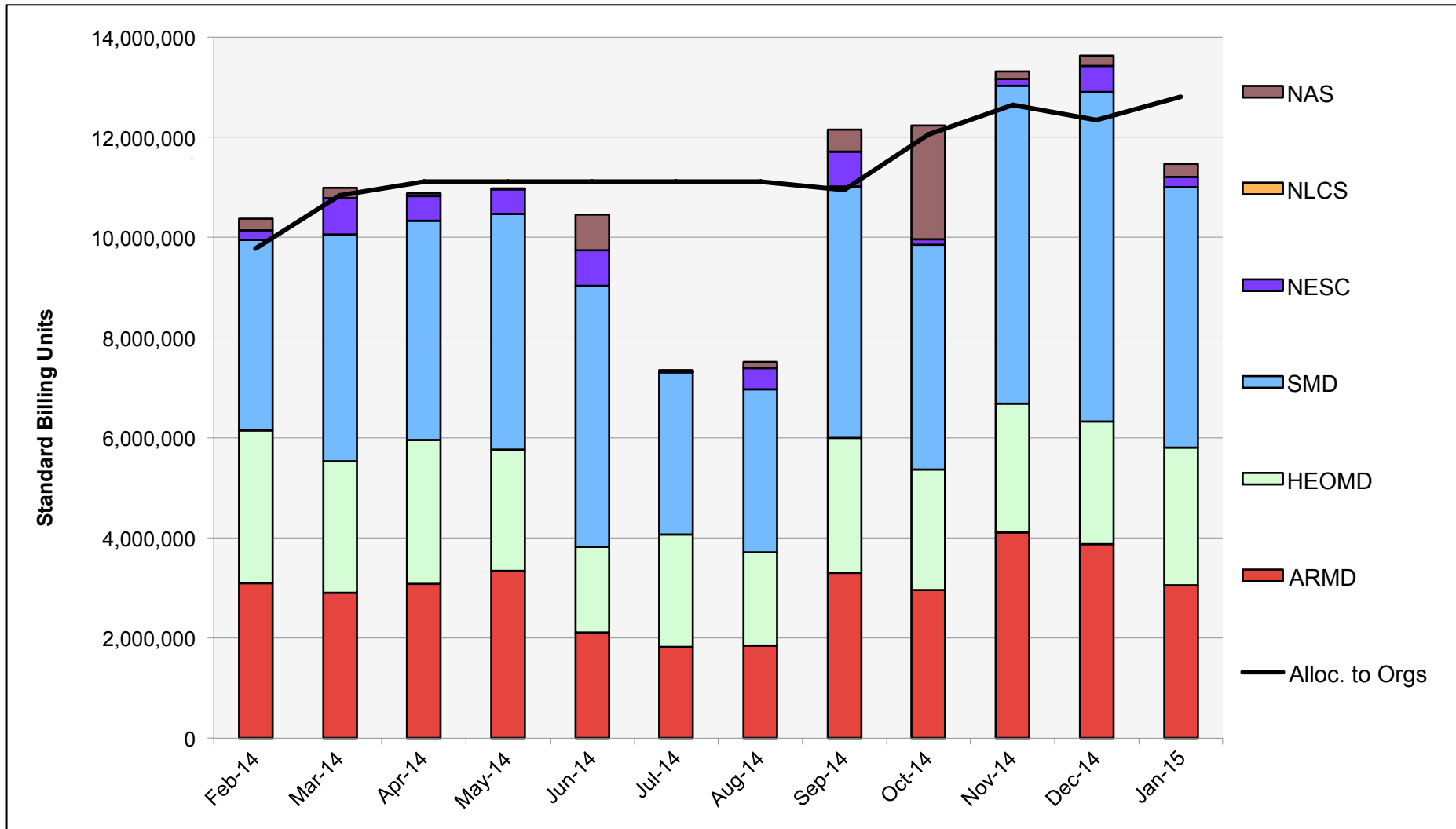


January 2015

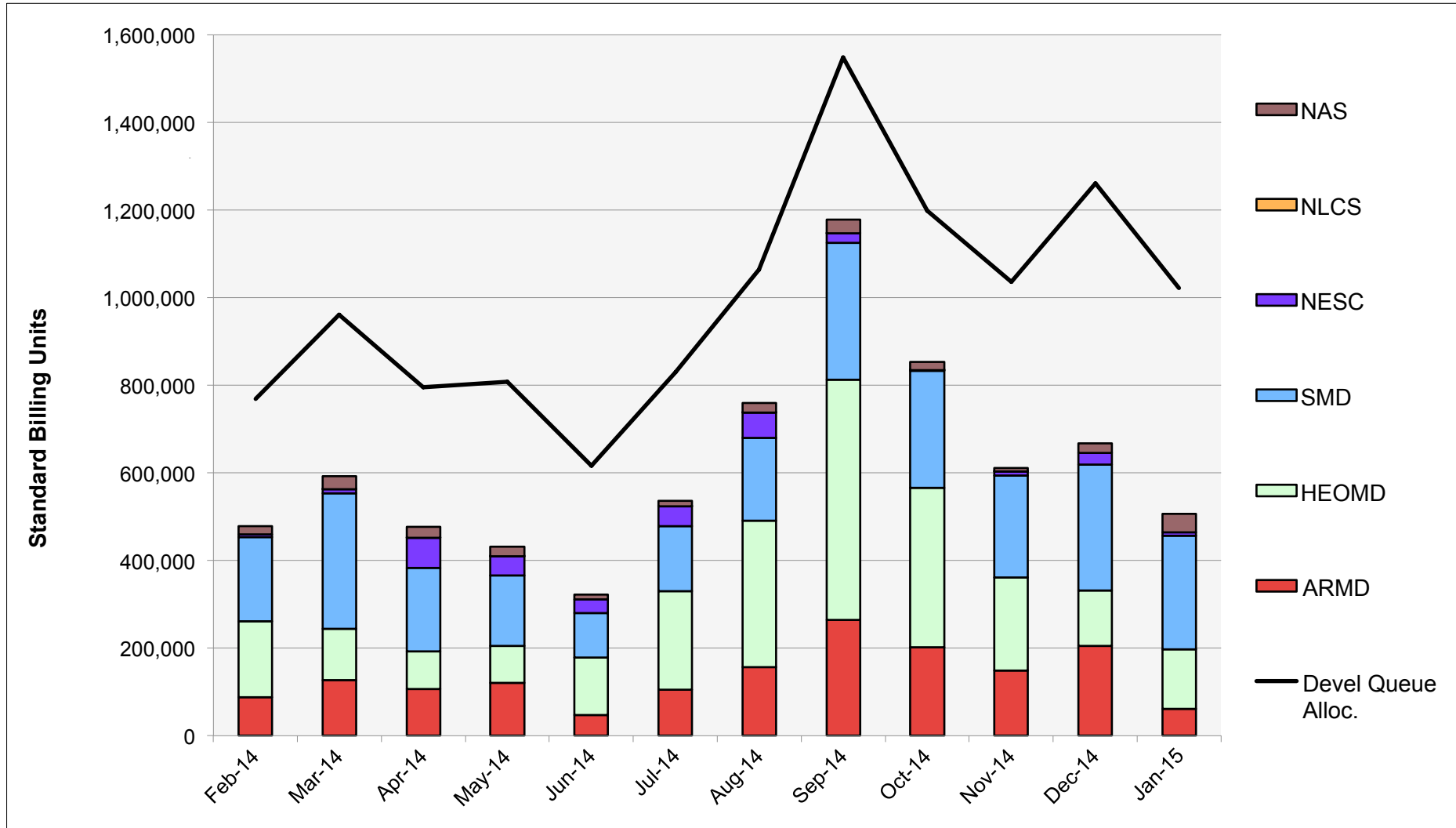
Tape Archive Status



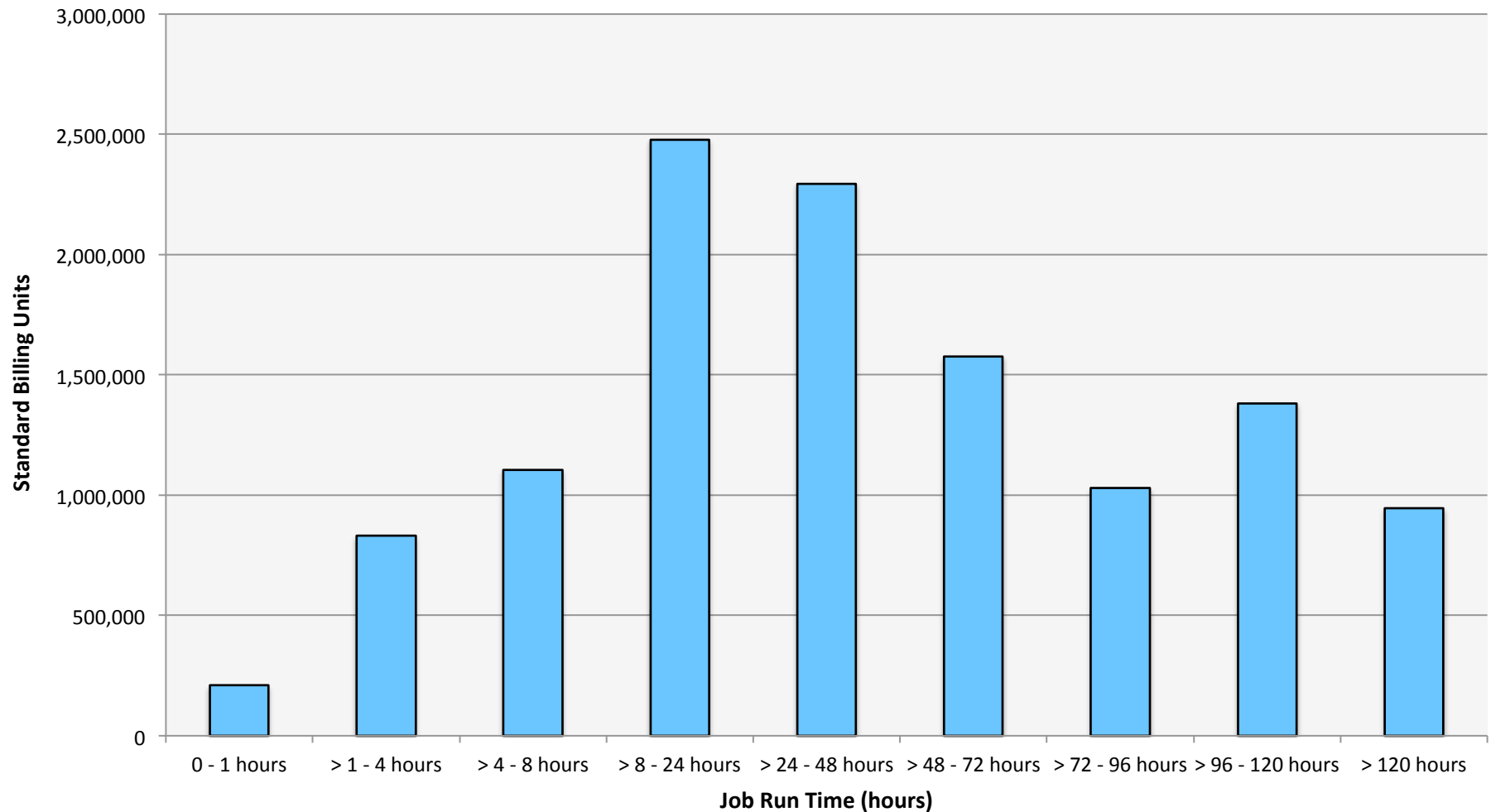
Pleiades: SBUs Reported, Normalized to 30-Day Month



Pleiades: Devel Queue Utilization

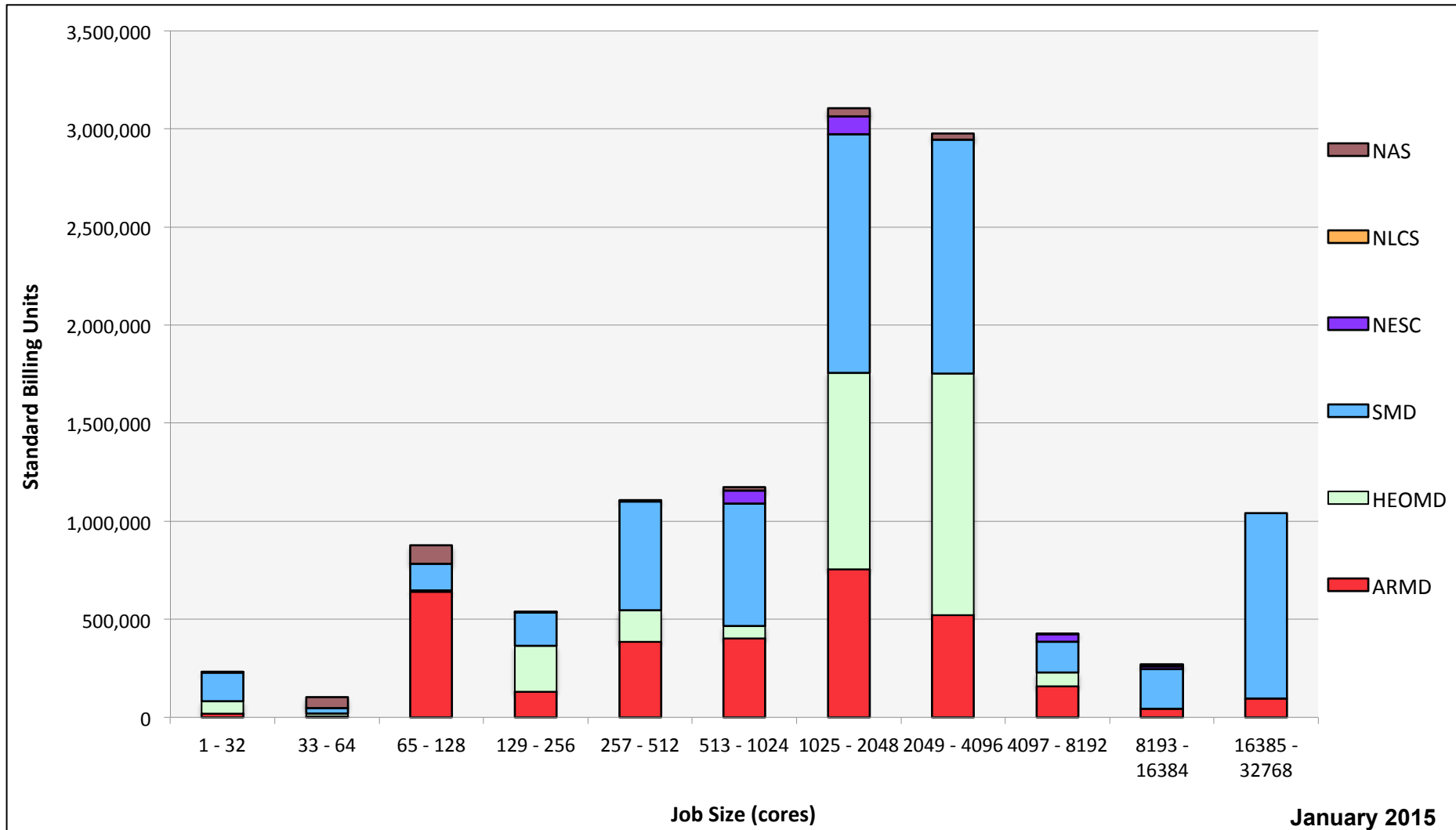


Pleiades: Monthly Utilization by Job Length

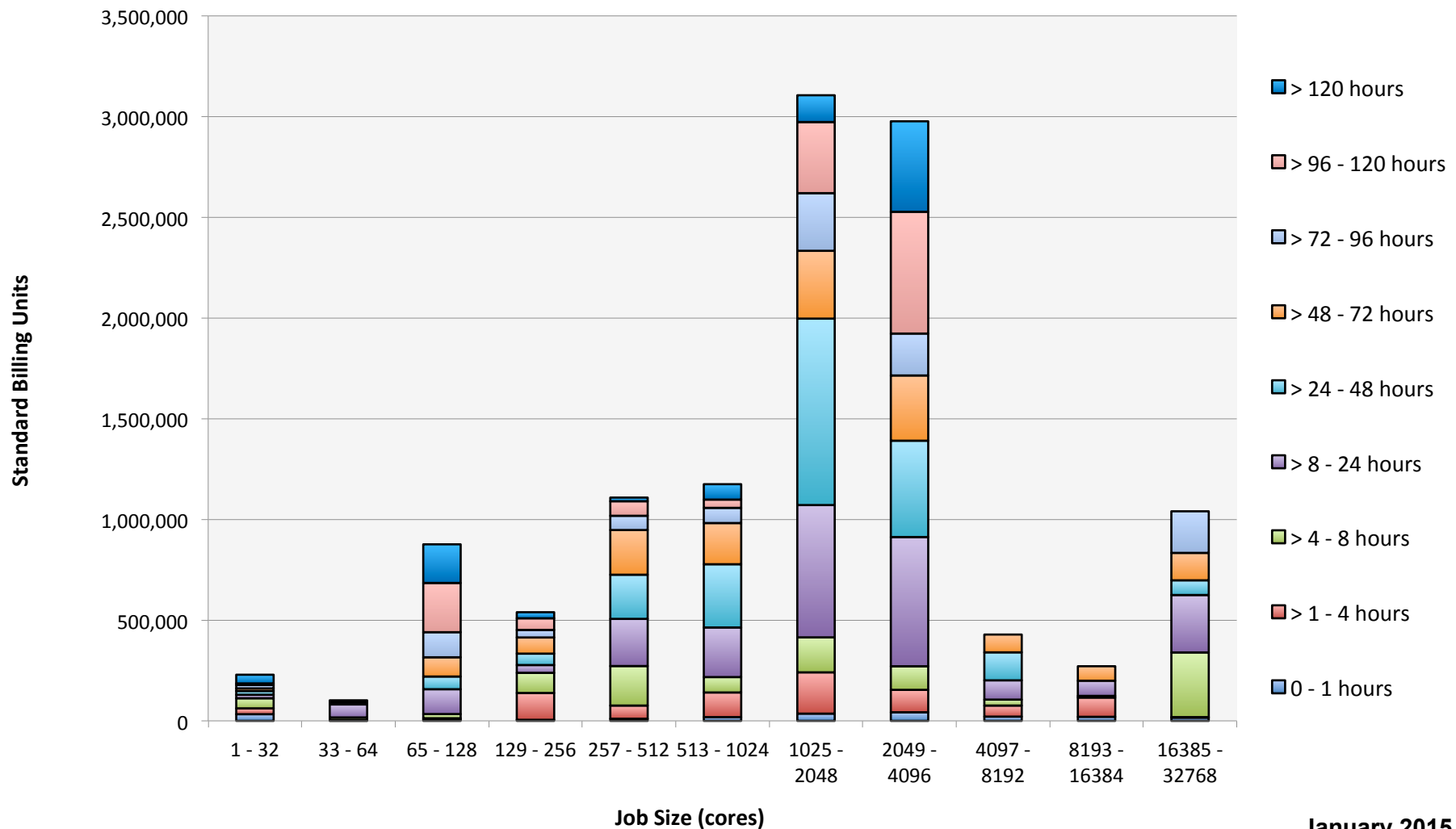


January 2015

Pleiades: Monthly Utilization by Size and Mission

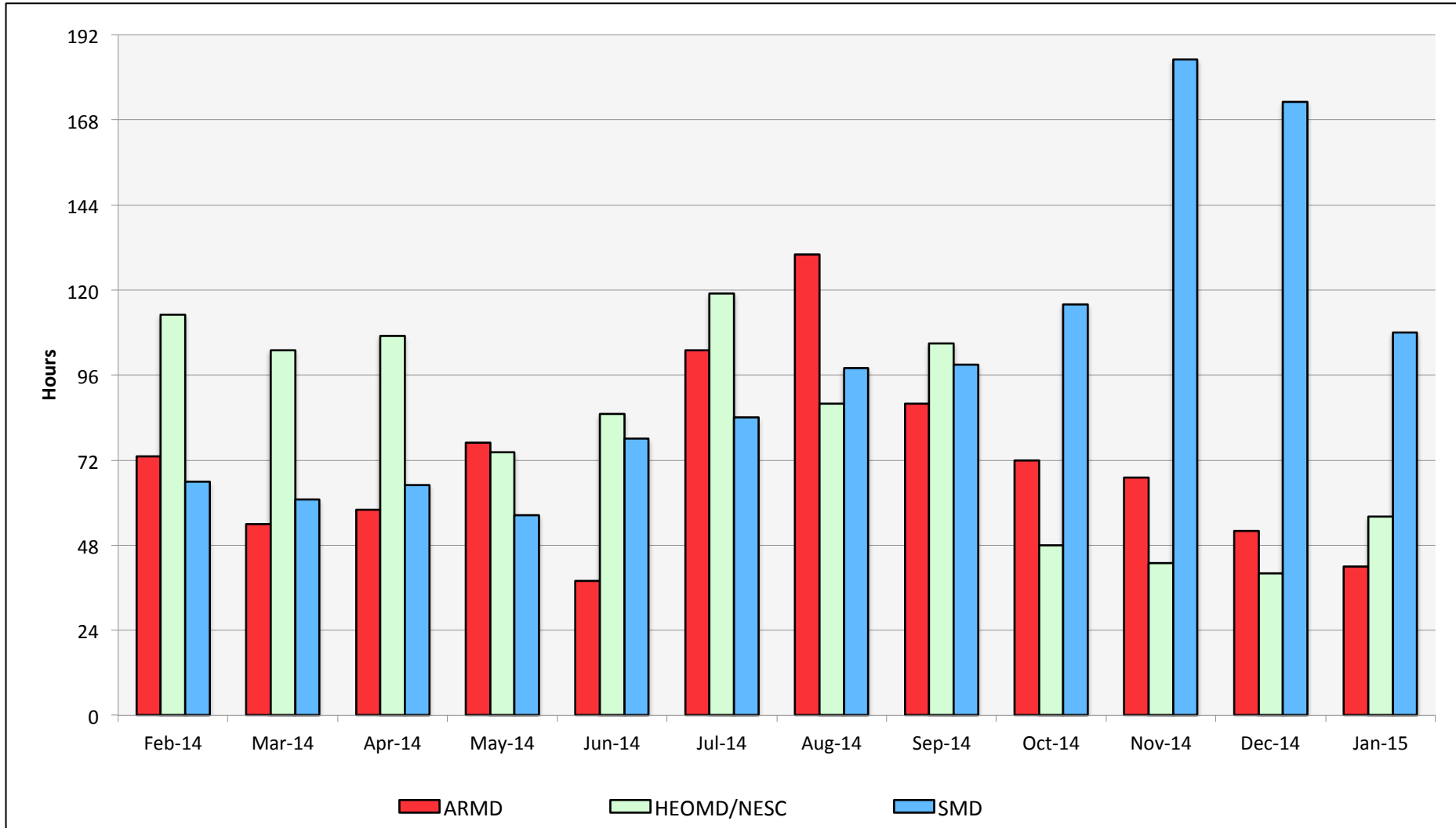


Pleiades: Monthly Utilization by Size and Length

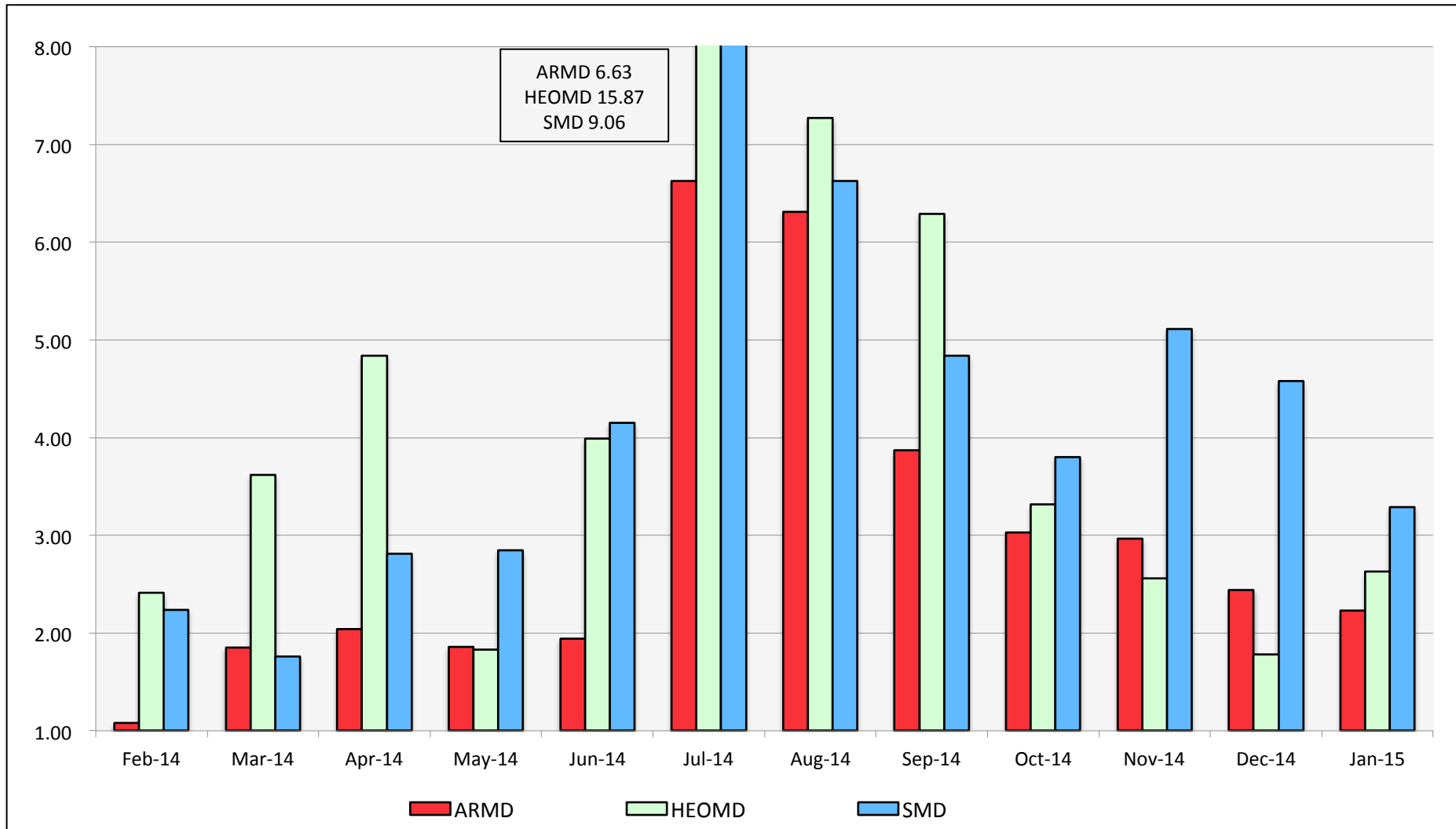


January 2015

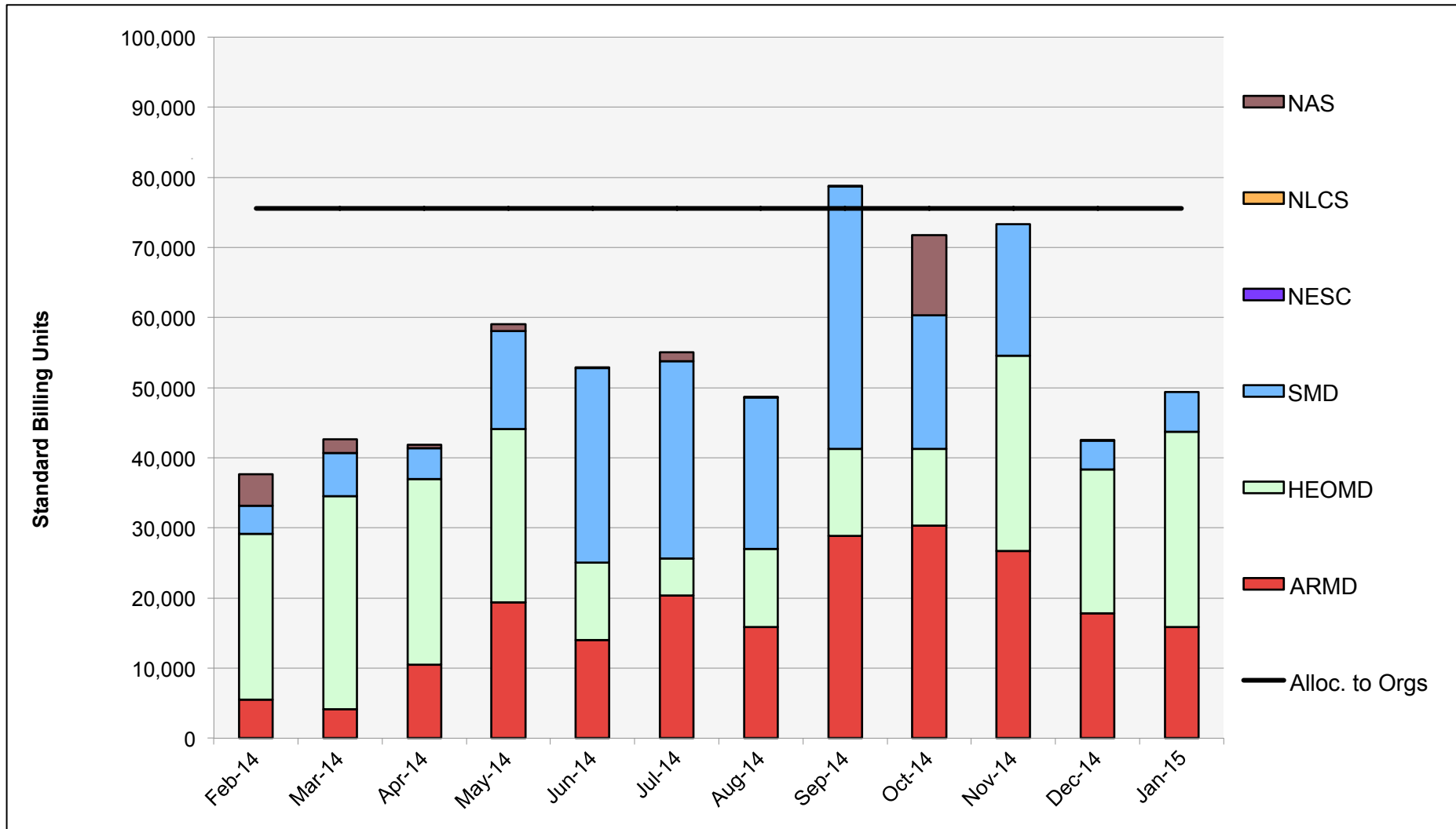
Pleiades: Average Time to Clear All Jobs



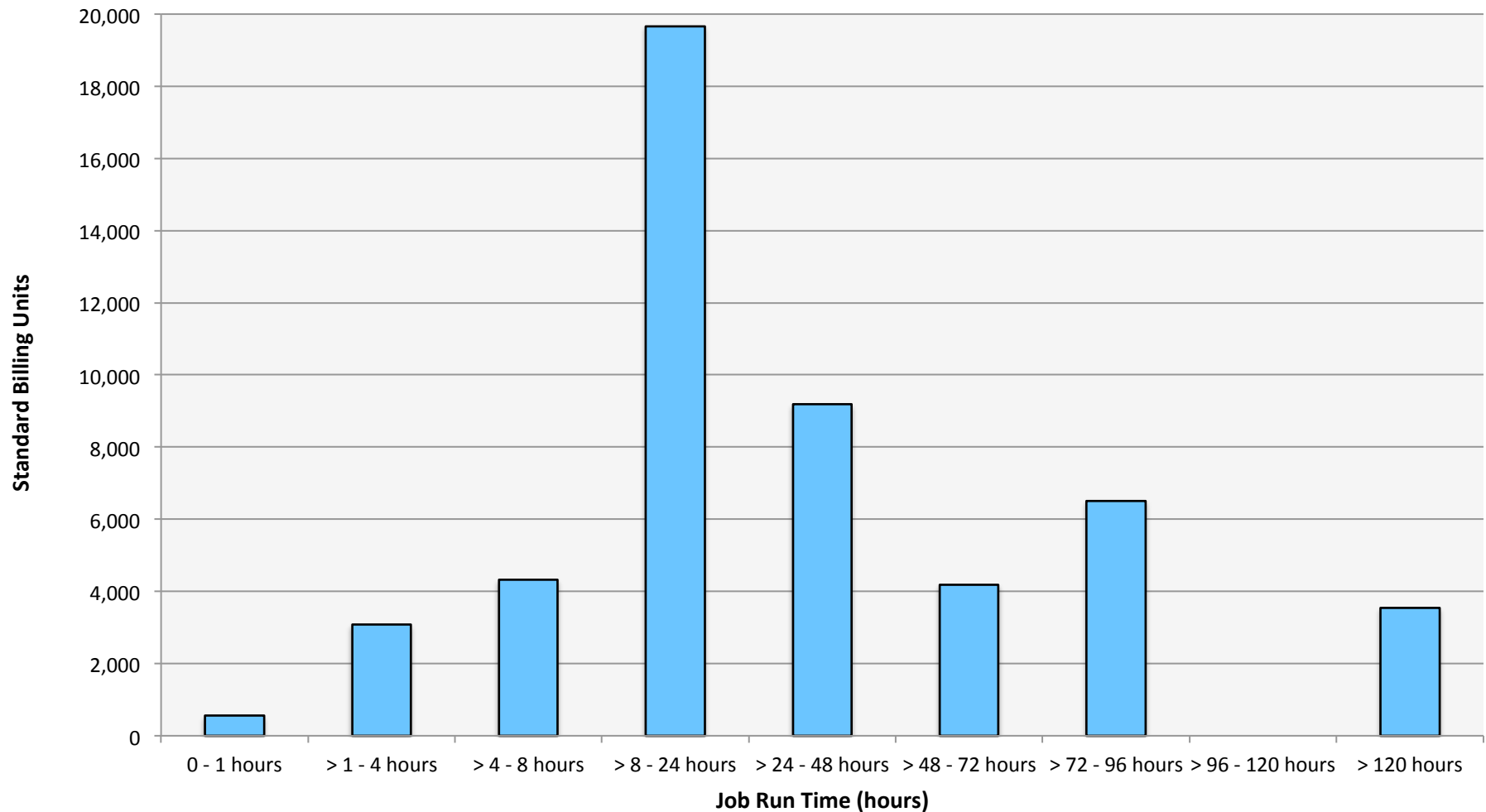
Pleiades: Average Expansion Factor



Endeavour: SBUs Reported, Normalized to 30-Day Month

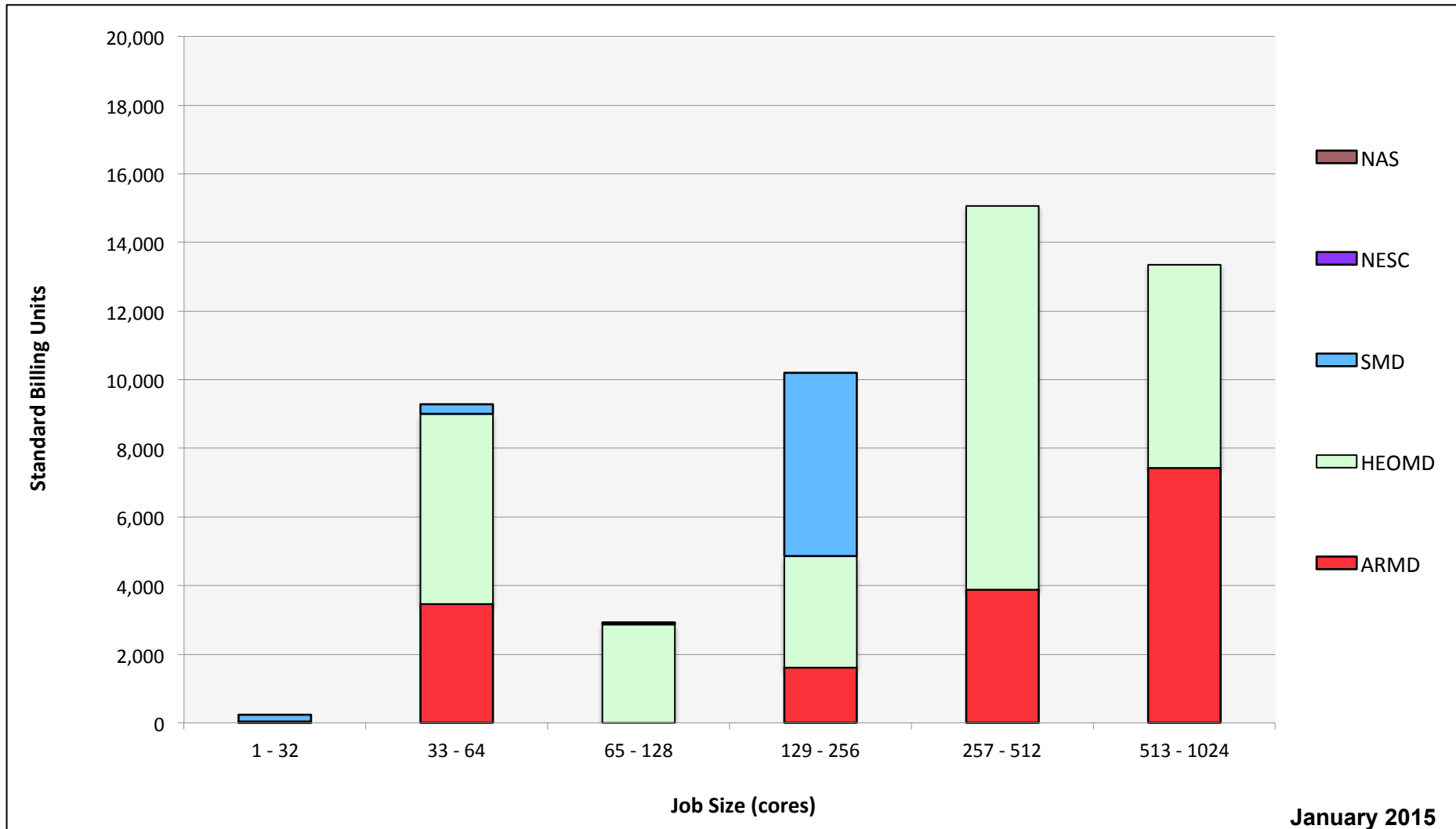


Endeavour: Monthly Utilization by Job Length



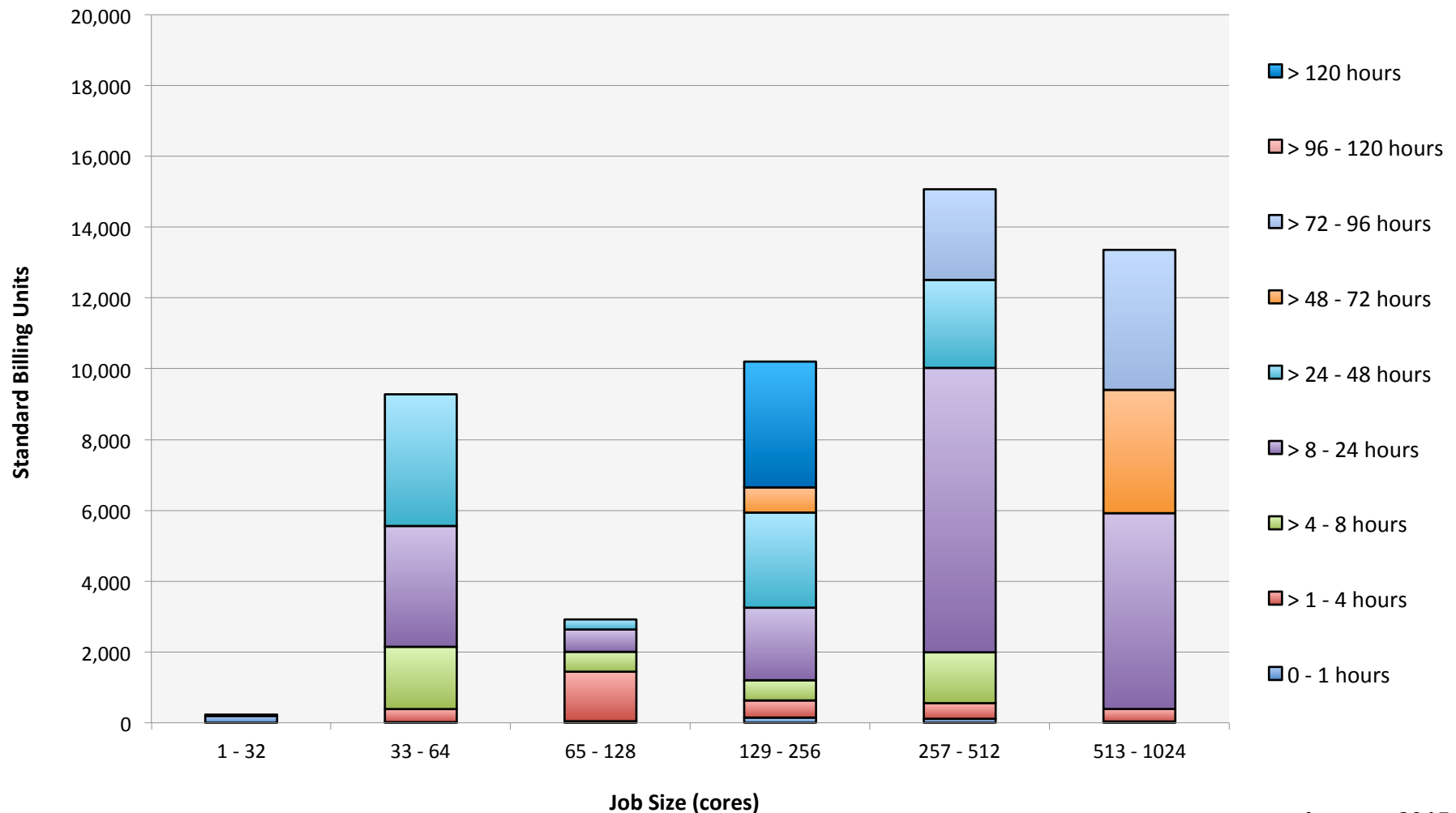
January 2015

Endeavour: Monthly Utilization by Size and Mission



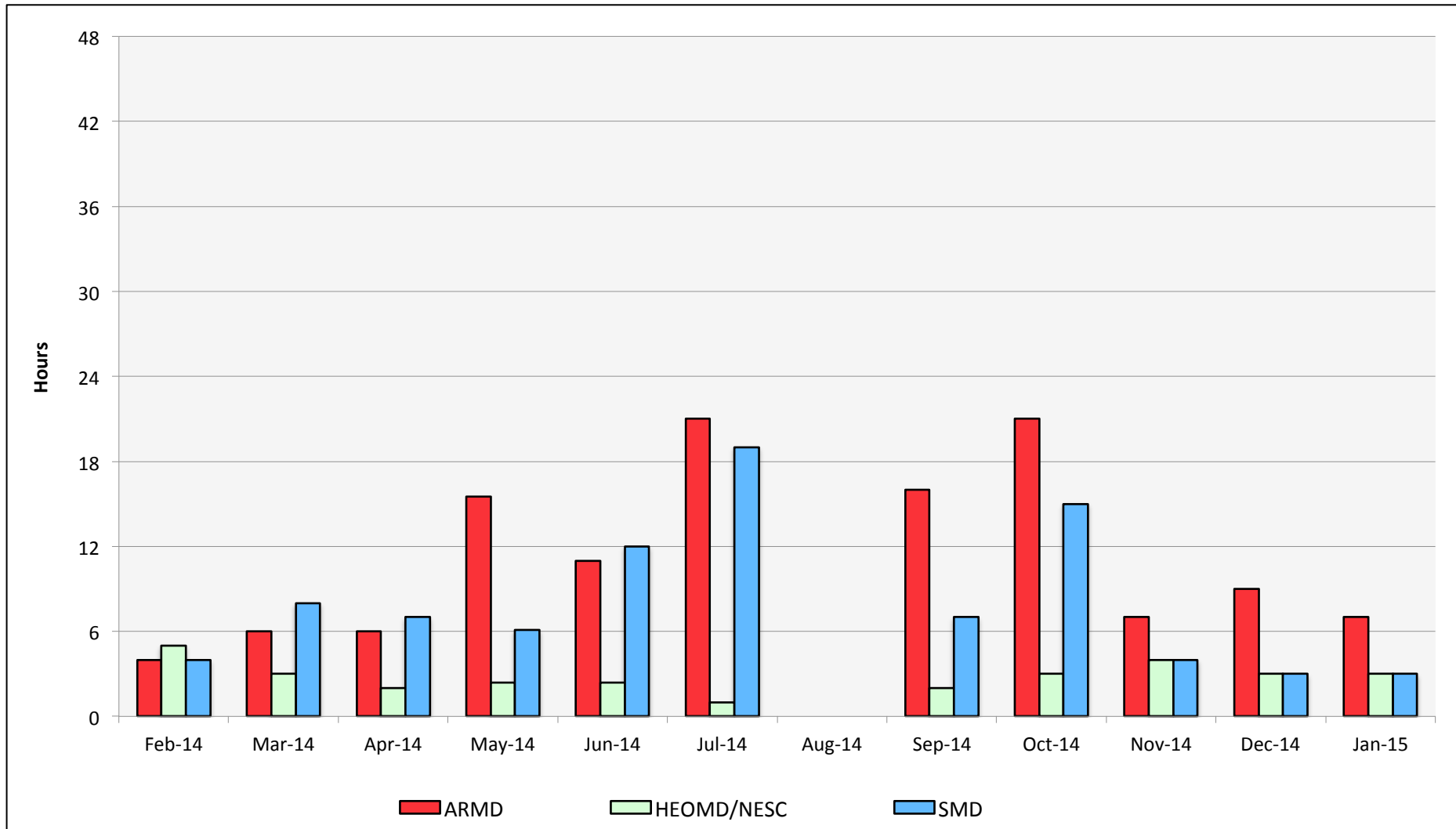
January 2015

Endeavour: Monthly Utilization by Size and Length

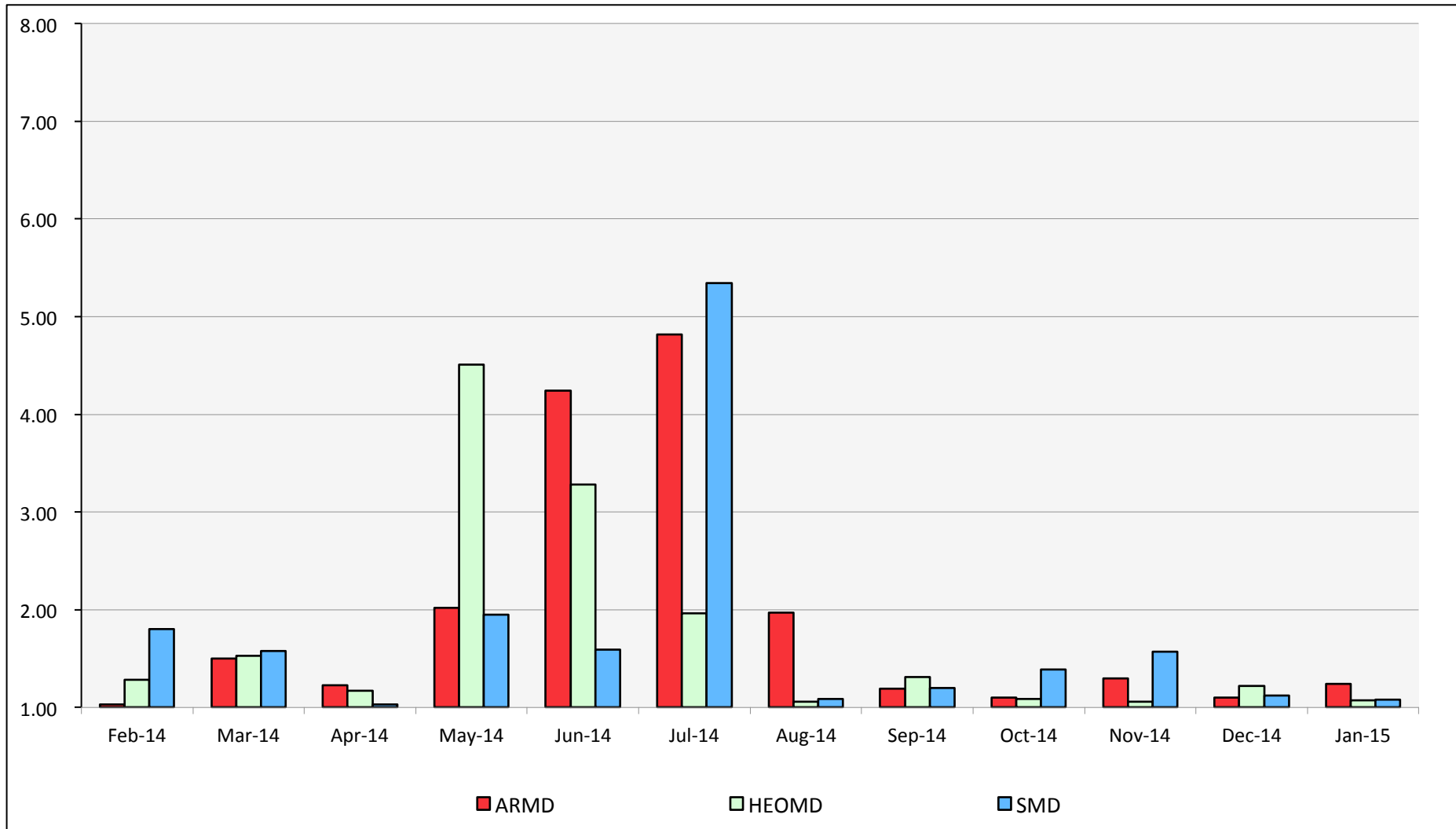


January 2015

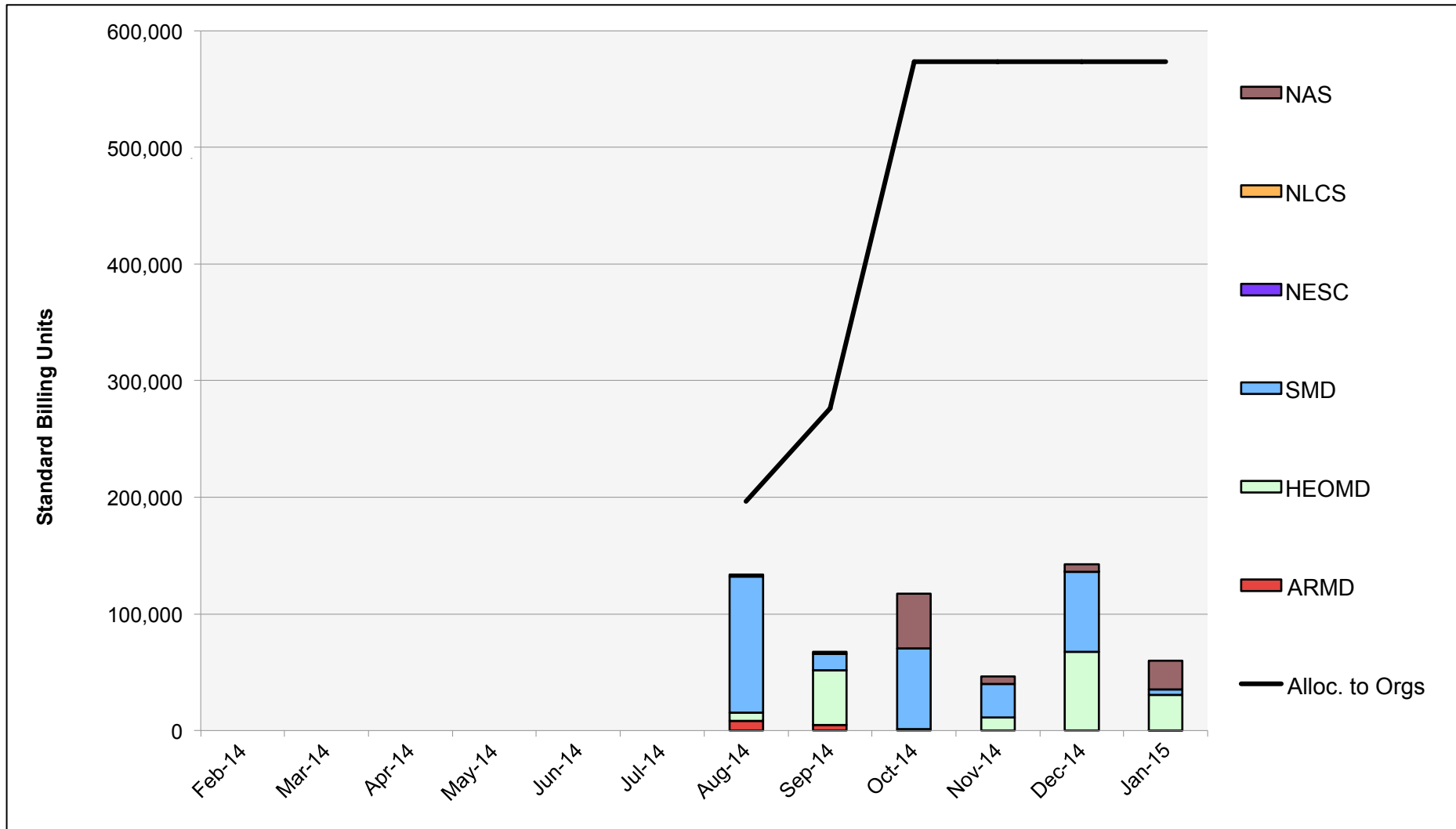
Endeavour: Average Time to Clear All Jobs



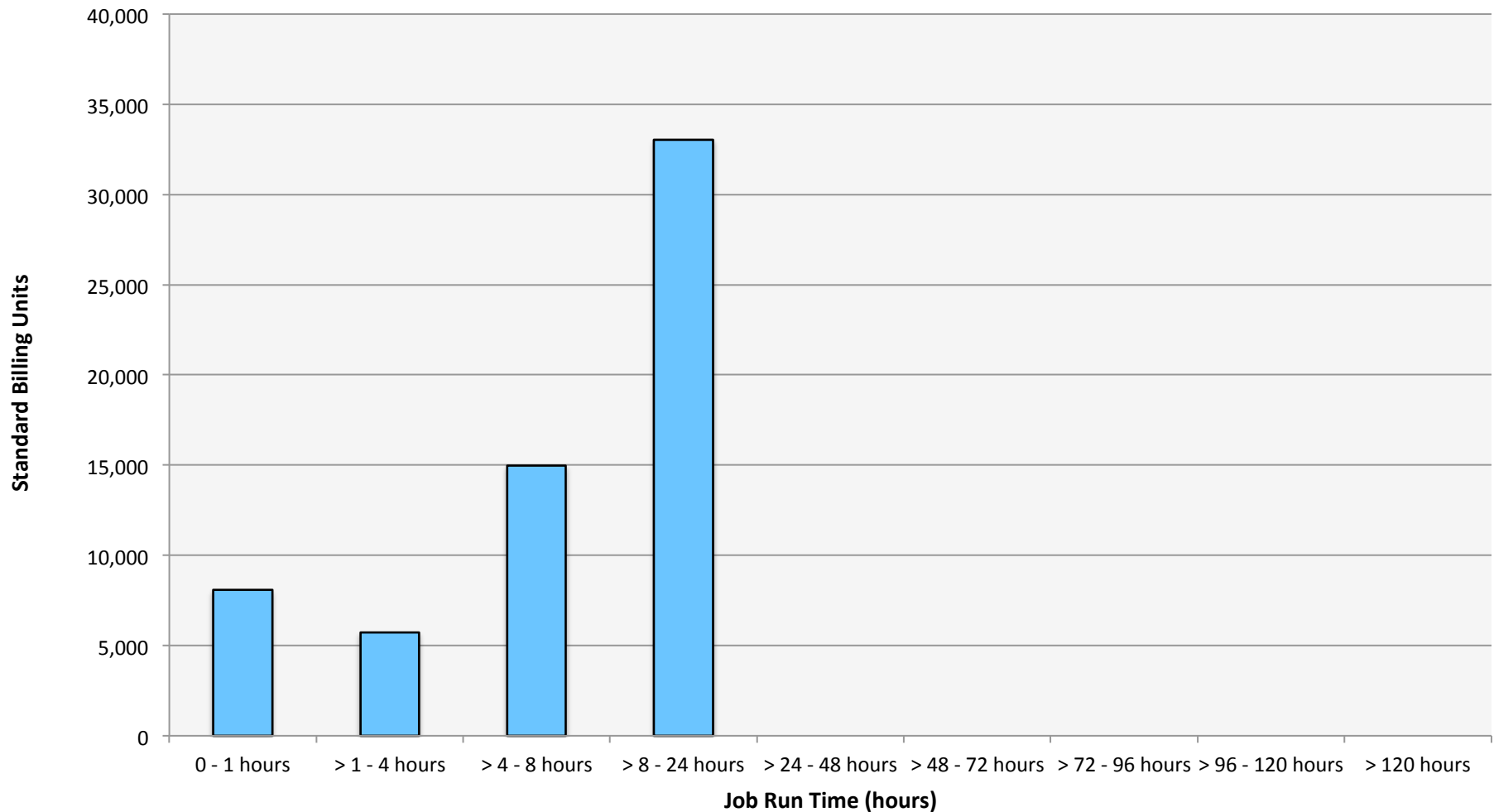
Endeavour: Average Expansion Factor



Merope: SBUs Reported, Normalized to 30-Day Month

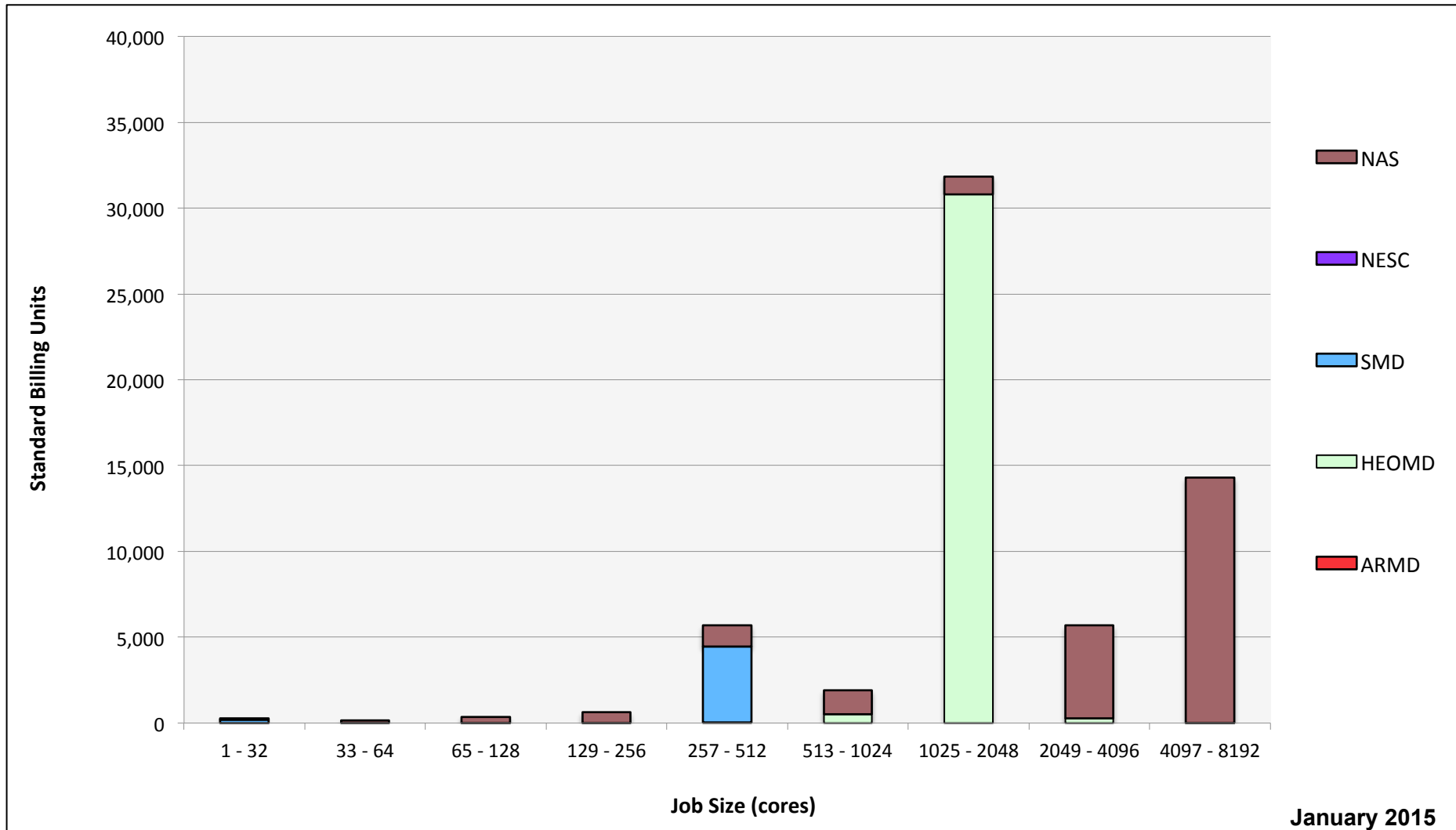


Merope: Monthly Utilization by Job Length

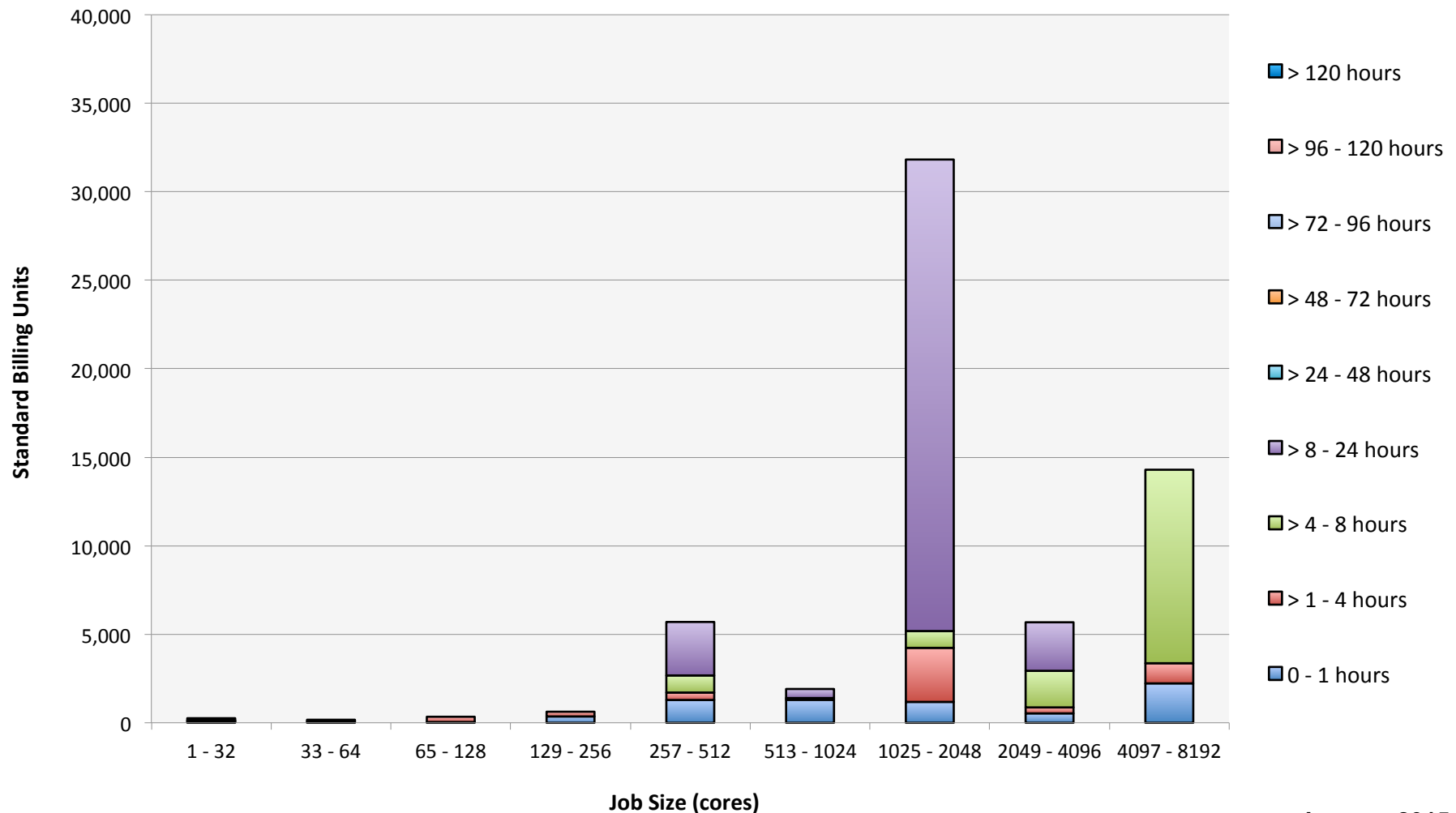


January 2015

Merope: Monthly Utilization by Size and Mission



Merope: Monthly Utilization by Size and Length



January 2015

Merope: Average Expansion Factor

